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ABSTRACT

This report presents results of Tennessee's 4-year longitudinal class size project: Student Teacher Achievement Ratio (STAR). The study analyzes student achievement and development in three class types: small classes with 13-17 students per teacher; regular classes with 22-25 students per teacher, and regular classes with 22-25 students per teacher assisted by a full-time teacher aide. Project STAR followed students from kindergarten through third grade, starting in 1985-1986 and ending in 1988-1989. Sections of this report concern: (1) background and purpose of the study; (2) study design; (3) descriptive data and teacher effectiveness; (4) primary findings; (5) the longitudinal analysis; (6) teacher in-service training; (7) effects of class size on classroom processes; (8) additional findings; (9) the cost-effectiveness of reducing class size or adding aides; and (10) a summary of the study. Numerous tables and figures supplement the text. Appended materials concern related legislation and literature, data processing issues, findings on teacher effectiveness, longitudinal tables across grades, student socioeconomic status, Project STAR Abstracts, and the relation of teacher aides to student performance. Citations number 156. (RH)

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THE STATE OF TENNESSEE'S STUDENT/TEACHER ACHIEVEMENT RATIO (STAR) PROJECT

TECHNICAL REPORT

1985-1990

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Tennessee Legislature

Senator Douglas Henry, Representative Steve Cobb

Tennessee State Board of Education

Nelson Andrews, Brent Poulton, Jim Parker, Bill Ives

Tennessee State Department of Education

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FOREWORD

This report presents the results of Tennessee's four-year longitudinal class-size project: Student Teacher Achievement Ratio (STAR). This longitudinal study analyses student achievement and development in three class types: small classes (13-17 students per teacher), regular classes (22-25 students per teacher), regular (22-25) with a full-time teacher aide.* Project STAR followed students from kindergarten (K) through grade 3 (G3), starting in 1985-1986 with kindergarten and ending in 1988-1989 with third grade.

Project researchers collected and analysed data to answer questions mandated by the legislation and other questions of interest to the project. The primary data analysis was conducted each year by Dr. Jeremy Finn, Consultant to Project STAR.

Individuals interested in obtaining speakers on Project STAR or those interested in Conducting student/teacher ratio or related research may wish to contact the:

Center of Excellence for Research in Basic Skills
Lasting Benefits Project
Tennessee State University
330 Tenth Avenue North
Nashville, Tennessee 37203-3401
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---

*Although in the fall of 1989 the Tennessee State Department of Education, in order to avoid confusion, changed the term teacher aide to instructional assistant, the term aide will be used throughout this report.

DEDICATION

This project is dedicated to the Kindergarten through Third Grade teachers of the State of Tennessee. A stellar star among these teachers was the late Peggy Douglas Nabors. Her genial temperament, her love for children, her persistent claim that small classes are in the best interest of children everywhere, and her gracious good-will in expending her energies in classes too large have given inspiration and hope to the writers of this project -- hope that the information contained within these pages will make a positive difference in the educational future of Tennessee's children.

Helen Pate-Bain

I. BACKGROUND AND PURPOSE

A. Background

By the start of his second term, Governor Lamar Alexander had established education as a top priority. In the spring of 1984, the Tennessee State Legislature adopted comprehensive education reform called the Better Schools Program. Although the media gave most attention to the career ladder for teachers, the Tennessee Center for Excellence program provided higher education with a means to work toward improving education in Tennessee. The Tennessee State University (TSU) Center for the Teaching of Basic Skills to Economically and Educationally Disadvantaged began a modest program on the effects of small class size in one Metro Nashville school. The director of that project, Dr. Helen Bain, encouraged the legislature to adopt a reduced class size program statewide. One model for what might be done in Tennessee was a program in Indiana, Project Prime Time, which studied reduced class size in grades K-2.

In the spring of 1985, information about the Indiana and the TSU studies was shared with the Tennessee State Board of Education Chairman and staff and the members of the House and Senate Education Committees. Steve Cobb, a member of the Tennessee House of Representatives, became interested in the issue of the optimum class size in the early elementary grades. The literature, particularly the Glass Meta-Analysis (1982), suggests that class size must be reduced to about 15 to 1 to have a noticeable effect on student achievement. Glass' analysis has been criticized because the type of school and student characteristics in small classes are unrepresentative of the average public school student, and some of the "small classes" were tutoring groups (Educational Research Service, 1980). Because the research results were not conclusive and because the cost of a major reduction in class size would be very large, Representative Cobb wanted the state to conduct a well-designed study of class size before investing in a costly new program. With legislation, House Bill (HB) 544 (see Appendix A), passed in May, 1985, the Tennessee Legislature authorized and funded a major policy study to consider the effects of class size on students in primary (K-3) grades. There was an appropriation of $3,000,000 for the first year of the four-year study.

B. Legislation

In the last ten years there has been some reduction in the average class size in Tennessee. According to the **Tennessee Rules, Regulations, and Minimum Standards** (0520-1-3-.04, p. 28), the student/teacher ratio shall not exceed 25 students per teacher in grades K-3. The average class size in Tennessee in 1985-86 was 22.3 in kindergarten and 23.5 in grade one, not including resource teachers, librarians, and other professional personnel who are often counted in the staff/student ratios. Because reduction of class size is costly, HB 544 calls for a study of the "effects of a reduced pupil-teacher ratio on the achievement of students in public school." The legislation established demonstration centers to be operated by local boards of education throughout the state and in sites described as inner city, urban, suburban, and rural. It was specified that demonstration small classes would have no more than 17 and no fewer than 13 students, and that a variety of models could be "authorized to study and measure the relative effects of providing planning time to teachers, staff development programs..., teacher aides,...," etc. (HB 544).

Section 49-3-405 of the bill explains the purposes of the legislation which include "measuring differences in **achievement** and **development** of pupils in demonstration center classes" (emphasis added). Further, the project evaluation must "encompass the goals established by the General Assembly in section 49-5-5023," Tennessee's Comprehensive Education Reform Act.

C. Background on Class Size

Probably few issues in education have been studied as often as class size, yet few studies have produced satisfactory or consistent results; many have reviewed class-size reductions from 40 to 30, or 30 to 25. There have been few major, controlled class-size studies. There have been even fewer that explored the 1:15 range suggested by Glass, et al. (1978). Before HB 544 and during the study, educators reviewed and summarized the research and continued to collect evidence on the effects of class size. Project STAR personnel built upon the prior research and developed several research summaries for the legislature and for STAR (e.g., Keenan; Doncaster; Bain; Achilles and Moore). Appendix B contains summary reviews of literature and research relating to class size.

D. Organization to Conduct the Study

The Tennessee State Department of Education organized to conduct the legislated study of reduced student/teacher ratio and adopted the name STAR, an acronym for Student/ Teacher Achievement Ratio. The Department employed Elizabeth Word, an experienced elementary principal, as project director and asked personnel from four universities (Memphis State University, Tennessee State University, the University of Tennessee at Knoxville, and Vanderbilt University) to develop the study design, plan the research, analyze the data, and prepare periodic reports of progress for the State Board of Education and the legislature. The State Department of Education retained management and budget control of the project, and the universities had both an advisory and an operational role. Responsibilities for direct contact with the 79 STAR schools (1985-86) were divided among the universities. Personnel from each university supplied assigned schools with information, collected data, and observed testing and other activities. The project director contacted all schools directly concerning administrative and fiscal matters and some research issues.

Thus, the organization to conduct the study consisted of a consortium of persons from the Tennessee State Department of Education, STAR staff, the four universities, and a representative each from the State Board of Education and the State Superintendents' Association. The term "consortium" refers to the total group that guided project activities.

The project was implemented rapidly through a cooperative effort of the consortium. Since the legislation passed in May and schools started in August, key policy, design and operational decisions had to be made very quickly.

The State paid salary costs for the extra teachers required to reduce class size and the project teacher aides and provided modest contracts to each of the four universities in the consortium. Major costs, about 2.5 of the 3 million dollars per year, were for additional teachers and aides in the project. During the third year of the study it was decided to have a follow-up year to collect information about the persistence of STAR achievement gains and to complete the data analysis. Funding for an additional year was requested and the legislature approved $389,500 for this purpose. Annual budgets for the five years are shown in Table I-1. During the first year, major immediate concerns were the development of a design for the overall project, procedures for assignment of students, details necessary for data collection, general operating procedures, etc.

TABLE I-1

Project STAR Expenditures 1985 Through 1990

	1985-86	1986-87	1987-88	1988-89	1989-90
Appropriation	$3,000,000	$3,005,000	$3,009,200	$3,213,446	$ 389,500
Personnel and Benefits	71,500	110,142	120,765	88,948	91,400
Travel	2,600	6,266	6,850	4,885	2,093
Printing	200	444	644	59	1,000
Communication and Shipping	1,900	4,926	4,645	2,093	5,600
Maintenance	600	65	572	215	-0-
Professional Services	146,200	268,733	608,249	443,463	280,000
Supplies	3,300	3,505	5,740	5,116	4,700
Rentals and Insurance	4,100	1,606	2,126	1,046	4,800
Teacher and Aide Salaries	2,181,400	2,578,904	2,229,468	2,690,107	-0-
Total Expenditures	**$2,411,800**	**$2,974,591**	**$2,979,059**	**$3,235,932**	**$ 389,500**

E. Questions to be Answered by the Demonstration and Study

1. Information from the Legislation

The legislation initiating Project STAR **specified** some basic questions and issues which the project should answer. The primary question came from the legislation's purpose, "...to study the effects of a reduced pupil-teacher ratio on the achievement of students in public school...." The project was "to make a longitudinal study of the relative effects of reduced pupil-teacher ratio on the achievement of pupils." The legislation specified that the small class size in the demonstration would be between 13 and 17 students for students in kindergarten in 1985-86; for these same students in the first grades (1986-87); for these same students in the second grade (1987-88); and in 1988-89 for these same students in the third grade.

The legislation required that participating schools represent different geographic regions and different kinds of communities (i.e., rural, urban, suburban, and inner city) and **suggested** that the study should also assess "relative effects" of reduced pupil-teacher ratio in varying school environments. The legislation permitted study of such things as teacher planning time, staff development for teachers, the use of teacher aides, the use of teachers with different levels of experience, and the differential effects of small classes on students from various socioeconomic backgrounds.

2. Questions Required by the Legislation

a. What are the effects of a reduced pupil-teacher ratio (13-17 to 1) on the **achievement** (normed and criterion tests) and **development** (self-concept, attendance, etc.) of students in public elementary school, grades K-3? Systematic comparisons are made of test performance among students in small classes, in regular classes, and in regular classes with a full-time teacher aide.

b. Is there a cumulative effect of being in a small class over an extended time as compared with a one-year effect for students in a small class for one year?

c. Does a training program designed to help teachers take maximum advantage of small classes or to use aides effectively improve student performance as compared with teachers who have no special preparation for their altered conditions? Do differences in teacher behavior attributable to staff development increase student learning?

3. Questions Suggested by the Legislation or by Previous Research

a. In which grade is the biggest effect for students in a small class evident?

b. What are the effects on student performance of a full-time aide in a regular class as compared with a regular class without an aide, or a regular class with a part-time aide? How does the performance of students with an aide (where the adult/pupil ratio is lower than in a small class) compare with student performance in small classes? Do certain patterns of use of aides have more effect than others? For example, does use of an aide in direct instruction have more effect than if the aide is used primarily in administration and clerical duties?

c. What are the various cost factors associated with class size reduction and the use of teacher aides?

d. Do teachers modify their teaching when they have small classes or when they have aides? If so, how do they change?

e. Is there a differential effect of small classes or classes with an aide on students from varying Socioeconomic Status (SES) backgrounds?

f. What teacher characteristics are associated with classes that have high achievement?

g. What other factors are associated with high-achieving classes?

h. What are the residual effects of small classes after the end of the project? (This would require follow-up that is not currently planned or funded.)

In July and August, 1985, there were several meetings in which the Commissioner of Education, staff members from the State Department of Education, the Executive Director of the State Board of Education, Representative Steve Cobb, and Senator Douglas Henry discussed the project design and the priorities for data collection. Based on this information, the design in the next section was developed, and a report was made to the State Board of Education at its October, 1985, meeting. During the year, consortium members and members of an external project advisory committee continued to refine the research design, questions and processes.

F. Sample Selection

The project timeline (legislation in May, director appointed in July, schools opened in August) required the consortium to decide upon a design and get students placed quickly. The first task, even while the design was being developed, was to identify school districts and schools to participate in the study. The ideal would have been that all school districts would opt to participate and that all choices (select districts to participate from among all districts in the state, then select schools, teachers, students, etc.) be made randomly.

1. Selection of Project Schools

The legislation specified that the project should include "inner city, suburban, urban, and rural schools" to assess the effects of class size in different school locations. No existing designation of schools used the categories specified above, so the consortium developed designations using various criteria.

Inner-city and **suburban** schools were all located in metropolitan areas. Schools that had more than half of their students on free or reduced cost lunch (indicative of a low-income family background) were tentatively defined as **inner city.** Schools in the outlying areas of metropolitan cities were classified as **suburban**.

In non-metropolitan areas, schools were classified as **urban** or **rural** depending on the location of the school. If located in a town of over 2,500 and serving primarily an urban population (the census definition of urban), the school was classified as **urban**. All other schools were classified as **rural**. All classifications were checked with local school officials to see if they agreed with the designation of their school. The application of these rules led to the classification of schools shown in Table I-2.

In kindergarten there were 17 inner-city schools and 16 suburban schools drawn from four metropolitan areas: Knoxville, Nashville, Memphis, and Chattanooga. Fifteen of the 17 inner-city schools were located in Memphis. There were 8 urban schools that serve non-metropolitan cities and large towns (for example, Manchester and Maryville). There were 38 rural schools.

Schools were spread across the state, not clustered in one section. The Commissioner of Education invited all Tennessee school systems to participate and sent guidelines for participation to each local system. These guidelines indicated that the state would cover additional costs for project teachers and teacher aides, but that local systems would furnish any additional classroom space needed. The project schools would not receive any special considerations other than class size--the students would use the regular district or school curriculum, supplies, texts, etc. There should be no major changes in process, organization, etc, other than class sizes. Schools should plan to remain in the project for four years; the project would start in kindergarten in 1985-86 and follow students successively through grades one, two and three.

TABLE I-2

Project STAR Schools by School Type
Kindergarten Through Grade 3 (1985-1989)

	Kindergarten	Grade 1	Grade 2	Grade 3
Inner City	17	15	15	15
Suburban	16	15	15	15
Rural	38	38	38	38
Urban	8	8	7	7
Total	**79**	**76**	**75**	**75**

All participating teachers had to be certified for the grade level they were teaching. Schools had to agree to the random assignment of teachers and students to the different class conditions. Initially, 180 schools in about 50 of the state's 141 school systems expressed interest in participating. Only about 100 schools had enough students in kindergarten (a minimum of 57) to meet the size criterion for participation. The size criterion was necessary because the project utilized a "within-school" design. The final selection of schools was based on (a) including at least one school from each district that had volunteered and (b) including enough schools from all four school types and all three regions of the state to permit comparisons between school types, as specified in the legislation. After discussion and negotiation, 79 schools in 42 systems became participants in the first year. The goal was to have approximately 100 small, 100 regular, and 100 regular with aide classes. This objective was met. In the 1985-86 year, the project had 128 small classes (approximately 1,900 students), 101 regular classes, (approximately 2,300 students), and 99 regular classes with teacher aides (approximately 2,200 students).

2. Selection of Comparison Schools

In addition to the project schools, information was needed about the performance of a comparable group of students whose teachers were carrying out the regular school program in average-size classes. Sometimes an experiment in a school will affect all students and all teachers. The use of a comparison group helped researchers to identify such effects. The superintendent of each system having project schools was asked if non-STAR elementary schools would administer the same tests used in STAR schools to provide comparison scores. Seventeen systems identified 39 possible comparison schools. Twenty-two schools with 51 regular classes and approximately 1,100 students became a comparison group. The 22 comparison schools, drawn from 17 STAR school systems, administered the same tests that the project schools administered. Comparison schools allowed STAR researchers to check on the possibility that project schools were influenced by the Hawthorne Effect.

G. Project Schools and Statewide Averages

Since selection of STAR **districts** was not random, it was important to see how the STAR districts compared to the averages for non-STAR systems on some key variables. The average **system** size of STAR schools was larger than the size for non-STAR groups since Memphis, Nashville and Knoxville--the largest systems in the state--participated. Project STAR **schools** were larger than the state average since small schools were excluded by the nature of design.

Researchers collected information on the project schools' expenditures per pupil, pupil/teacher ratios, teacher education levels, and student test achievement and compared these with statewide averages to check the representativeness of the STAR sample. Project STAR **systems** were similar to the statewide system average on most variables (Table I-3) except system size.

The 1985-86 data show that regular kindergarten classes in STAR schools were slightly, less than one student, larger than the statewide class size in kindergarten. Resource measures, including teacher salaries, per-pupil expenditures, and teacher preparation were available at the system level but not at the individual school level. Project STAR systems include Metro Nashville and Memphis which spend substantially more than the state average per pupil and pay their teachers higher salaries than the state average. The STAR system per-pupil expenditures were about 6 percent higher than the state average, and teacher salaries were about 3 percent higher. (See Table I-3.)

TABLE I-3

Teacher Salaries, Per-Pupil Expenditures, and Teacher-Pupil Ratios State Average and Project STAR School Systems Average

Item	STAR Average	State Average
Per-Pupil Expenditure (1986-87)	$ 2,724	$ 2,561
Average Teacher Salary	$ 23,168	$ 22,627
Average System Size	8,462	4,202
Teacher-Pupil Ratio Kindergarten (1985-86)	22.7*	22.3
Percent of Teachers with Master's Degree or Higher (System Figures)	42	40

*Based on regular-sized STAR classes

Note: Project STAR systems are weighted by the number of students or teachers from each system who are participating in the project.

A comparison of test scores for grade-two students in project schools, the comparison schools, and the statewide average (see Table I-4) indicated that project schools had scores lower than the state average and the average of the comparison schools. These differences reflect the higher proportion of inner-city schools in STAR; students in inner-city schools scored 10 to 12 points lower on the average than students in suburban schools. Differences in scores among urban, rural, and suburban schools were smaller. The comparison schools did not include any inner-city schools. STAR schools in the same systems with comparison schools scored slightly (not significantly) higher than the comparison schools.

TABLE I-4

Reading and Math Scaled Scores, Stanford Achievement Test Project STAR, Grade 2 (Spring 1986) Selected Comparisons

	Math	Reading
State Average for 2nd Grade	572	582
All Project STAR Schools	566	578
Comparison Schools	577	587
STAR Schools (Same Systems as Comparison Schools)	579	590

H. Data Collection Plan and Data Base

A major first-year task was to plan and implement a comprehensive data collection plan for the first and subsequent years. The design and data formats allowed researchers to follow individual students for four years. Subjects were assigned individual identification numbers. Data were collected for students, teachers, principals, teacher aides, schools, and systems (see section II-E). Each child in the appropriate grade in comparison schools received an identification number and information was collected about race, sex, age, free or reduced lunch (one indicator of socioeconomic status), and test scores.

In seeking information about why a small class might affect student learning, researchers collected data about how teachers teach, about student-teacher interactions, etc. Data were also collected on factors that might affect the results: the number and distribution of special education children, pull-out programs, and adults other than the teacher who participate in the instructional program. Appendix C contains a list of instruments and copies of the data collection forms as well as descriptions of the standardized tests.

I. General Operating Guidelines

Two general guidelines helped project personnel with operational decisions.

1. Participation in STAR would not cause any child to receive fewer services than if the child/school did not participate. (Participation in STAR would not put any child "at risk" in any way.)

2. STAR would not dictate changes (e.g., curriculum, materials, schedule) to the school; STAR efforts would work within the regular school framework (with the exceptions of student and teacher assignment, ability grouping across classes, testing, etc.) as much as possible. STAR would minimize disruptions to the school's regular routine. Schools would maintain the random assignments, and basic instruction would be carried out primarily in the classes to which students were assigned.

J. Teacher Orientation

Orientation sessions were conducted for teachers at 20 schools entering the project in kindergarten. The orientation idea was later refined and used for all principals and all teachers entering the project. The person conducting the orientation described the project, its purposes and processes, and answered questions. The orientation process for new teachers entering the project at each grade level was also expanded after the first year and made more comprehensive.

K. The Advisory Committee and External Assistance

Two nationally recognized experts on class-size research and measurement served as an external review and advisory committee. They were Dr. Doris Ryan of the Ontario Institute for Studies in Education and later at St. Johns University, New Brunswick, who has extensive experience in the conduct of class-size studies, and Dr. Roy Forbes of East Carolina University (and later at the University of North Carolina, Greensboro) and former director of the National Assessment of Educational Progress. Several researchers from Memphis State University, Tennessee State University, the University of Tennessee, Knoxville and Vanderbilt University reviewed the project's design and the work plans and suggested ways to improve the design. As a result of their suggestions, the comparison schools were added to the design. The consultants reacted favorably to the within-school design and the study plans. Dr. Jeremy Finn, a nationally acclaimed educational statistician from the State University of New York at Buffalo, assumed responsibility for primary analyses of class-size effects for each year of the project.

L. Scope of Project STAR

The STAR data base is extremely large and there have been and will continue to be many opportunities for different and expanded analyses using all or different portions of the data. The analyses could employ different methods or statistics and even different basic designs (e.g., using student level vs. class level data). The heart of the STAR Final Report is built around class-level data as analyzed by the external consultant, Dr. Jeremy Finn.

Numerous papers have been developed and presented at national, regional, and state meetings and conferences. Some articles based on STAR data and concepts have been disseminated. These and other detailed papers and reports are available from Tennessee's Assistant Commissioner of Curriculum and Instruction, Project STAR, Tennessee State Department of Education, Cordell Hull Building, Nashville, Tennessee 37243-0379.

II. STUDY DESIGN

A. Introduction

The STAR design had to provide answers for questions required by the legislation, meet requirements for a longitudinal study, review one-year or cross-sectional effects of the treatment, and answer questions of interest. Two key design decisions were to have a within-school design and random assignment of both teachers and students to class types. STAR was a randomized experiment conducted **in situ**. The control-group design was Campbell and Stanley (1963) Design Number 6, a randomized experiment employing post-test analysis only. The primary analysis was built on post-test only design. Additional analyses employed other analytic models.

B. Choice of Within-School Design

Because of potentially large differences between schools (i.e., school effects) in such items as resources, teachers and students, the consortium chose a within-school design. A within-school design reduced major sources of possible variation in student achievement attributable to school effects. This decision required that each school have sufficient enrollment in each grade (at least 57 students) to provide at least one small (13-17 enrollment), one regular (22-25), and one regular with a full-time aide (22-25) class. In schools with larger enrollments, additional classes were established. This design assured that there would be the same kinds of students, curriculum, principal, policy, schedule, expenditures, etc., for each class type by school and avoided the problem of control groups that were not motivated to attend carefully to project needs since they probably would gain nothing by remaining in the project. In the within-school design the control classes participated fully in all testing, etc., since it was part of the project. An entire project school might do better than expected due to project participation (the halo or Hawthorne effect). Reciprocally, it was also possible that competition could occur within the school whereby the control teacher(s) would work extra hard (the John Henry effect).

After initial selection of participating systems, the choice of schools within systems was partly a function of school size. Grade-level enrollment determined the number of classes of each type established in each school. For example, the 79 schools selected to participate in Project STAR (kindergarten) provided enough classes (small, regular, regular w/aide) to meet the design estimate of approximately 100 classes of each type.

C. Selection into the Three Conditions

The 79 project elementary schools selected in the first year served rural, urban, suburban and inner-city students. The within-school design required each participating school to have three or more classes. Larger schools had more classes distributed among the three class types. Table II-1 shows the design configurations for establishing classes in schools of various sizes. A student in a small class in kindergarten remained in the small class for grades one, two and three, to assist the measurement of cumulative effect of the class type. In kindergarten (1985-1986), there were 128 small classes, 101 regular classes, and 99 regular classes with full-time teacher aides. Approximately 6,500 students participated in Project STAR in kindergarten.

TABLE II-1

Plan for Distribution of Students and Classes in Within-School Design: Project STAR (1985-1986)

Design Type	Enrollment (ADM)	Classes (N)	Class Types	Extra Room Needed
One	57-67	(3)	S,R,R/A	No
Two	68-78	(4)	S,S,R,R/A	Yes
Three	79-92	(4)	S,R,R/A,R/A or S,R,R,R/A	No
Four	93-109	(5)	S,S,R,R,R/A or S,S,R,R/A,R/A	Yes
Five	110-134	(6)	S,S,R,R,R/A,R/A	Yes
Six	135+	(7+)	Individually Designed	Yes

S=Small Class (1:13-17);R=Regular Class (1:22-25);
R/A=Regular Class with a Full-time Teacher Aide (1:22-25)

The plan described in Table II-1 was used to govern the selection of class condition throughout the study. Once assigned to a class type a student was to remain in the assigned class type as long as he/she was in the project. Due primarily to teacher-identified discipline problems and some parent complaints, the STAR consortium had to revise this procedure after the kindergarten year. Since there were no differences on any measure for students in regular and regular with aide classes, students who had been in these class types in kindergarten were reassigned randomly within the two class types for first grade. The external advisory committee informed STAR that this interchanging could create problems in conducting longitudinal analysis. Therefore, first grade was the only grade in which students in regular and regular with aide classes were permitted to interchange. No further changes were made after first grade. Table II-2 lists STAR schools and systems and shows the location designation and class type design for kindergarten through third grade. Figure II-1 shows how the participating schools were distributed across the state. Table II-3 shows the number of schools and students by location for each year of the study.

D. Modifications in Study Design

In a large-scale field project some changes occur that cannot be anticipated. Schools may drop out of the project; classes will gain or lose students; and in some cases these changes will make a class too small or too large for the design. The researchers took these possibilities into consideration by over designing the project. A power test at the beginning of the project indicated that it would be possible to detect a small achievement difference (3% or more) with only 80 classes of each type, or a total of 240 classes, rather than the 329 that actually participated. At the end of kindergarten, 34 classes had either too many or too few students for the original design (e.g., a small class may have ended up with 12 students rather than staying within the 13-17 range). Data were analyzed both including and excluding the 34 classes and results of both analyses were substantially the same. Oversampling was necessary because of the expected attrition of students and schools over the project's four years.

TABLE II-2

Project STAR Systems, Schools, and Designs Kindergarten through Third Grade (1985-1989)

		Design			
System	School	Kindergarten	1st Grade	2nd Grade	3rd Grade
		S R A	S R A	S R A	S R A
Bedford	Thomas Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Bledsoe	Pikeville Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Blount	Bungalow Elem.	1-1-1	Withdrawn	Withdrawn	Withdrawn
Blount	Midsettlements	1-1-1	2-1-1	2-1-1	2-1-1
Blount	Rockford Elem	1-1-1	2-1-1	2-1-1	2-1-1
Chester	East Chester Elem.	2-2-1	2-2-2	2-2-2	3-1-2
Claiborne	Ellen Myers Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Claiborne	Tazewell (TNT) Elem.	2-2-2	2-2-2	2-1-2	2-1-2
Clay	Celina Elem.	2-1-1	2-1-1	2-1-1	2-1-1
Coffee	North Coffee Elem.	1-1-1	1-1-1	2-1-1	2-1-1
Cumberland	Homestead Elem.	1-1-1	1-1-1	2-1-1	2-1-1
Cumberland	Crossville Elem.	2-1-2	2-1-2	2-1-2	2-1-2
Davidson	Rosebank Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Davidson	Hattie Cotton Elem.	1-1-1	2-2-1	2-1-1	2-1-1
Davidson	Cole Elem.	3-2-2	3-5-4	3-4-4	3-2-4
Davidson	Andrew Jackson Elem.	1-1-1	2-2-1	3-1-1	3-1-1
Decatur	Parsons Elem.	2-1-1	1-1-2	1-1-2	2-0-2
Dyer	Newbern Elem.	1-1-1	1-2-1	1-2-1	1-2-1
Fentress	York Elem.	2-1-1	2-1-1	2-1-1	2-1-1
Hamilton	Daisy Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Hamilton	Ganns-Mid Valley	2-1-1	1-2-1	1-2-1	1-2-1
Hamilton	Soddy Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Hancock	Hancock Central Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Hardin	Parris South Elem.	2-1-1	2-2-1	2-2-1	3-1-1
Hardin	Savannah North Elem.	1-1-1	1-1-1	2-1-1	3-0-1
Humphreys	Waverly Elem.	2-2-2	3-2-2	3-2-2	3-2-2
Jefferson	Jefferson Elem.	2-2-1	2-2-1	2-2-1	2-2-1
Jefferson	White Pine Elem.	1-1-1	1-1-1	2-1-1	2-1-1
Knoxville	Alice Bell Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Knoxville	Bearden Elem.	2-1-1	Withdrawn	Withdrawn	Withdrawn
Knoxville	Rocky Hill Elem.	2-1-1	1-1-1	2-1-1	2-1-1
Knoxville	Sara Moore Greene	2-1-1	1-1-1	2-1-2	2-1-2
Knoxville	Green Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Lawrence	South Lawrence Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Lawrence	Lawrenceburg Elem.	2-1-1	2-1-1	2-1-1	2-1-1

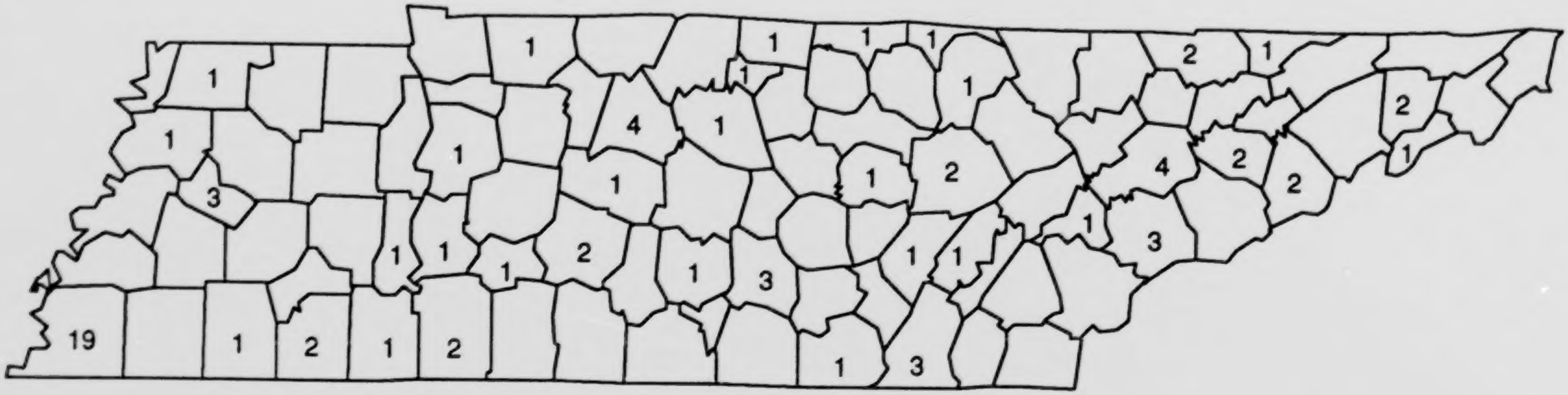
TABLE II-2 Cont.

System	School	Kindergarten	1st Grade	2nd Grade	3rd Grade
		S R A	S R A	S R A	S R A
Lenoir	Lenoir City Elem.	2-1-2	2-1-2	2-1-2	2-1-2
Lewis	Lewis County Elem.	2-2-2	2-2-2	2-2-2	3-2-2
Macon	Enon Kindergarten	2-2-1	Kindergarten	Only	
Macon	Fairlane Elem. 1-3		2-2-2	2-2-2	2-2-2
Manchester	College Street Elem.	1-1-1	1-1-1	2-0-1	2-0-1
Marion	South Pittsburg Elem.	2-1-1	2-1-1	2-1-1	2-1-1
Maryville	John Sevier Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Maury	Mt. Pleasant Elem.	2-2-1	2-2-2	2-1-2	2-1-2
Maury	Spring Hill Elem.	2-1-1	2-1-1	2-1-1	2-1-1
McNairy	Selmer Elem.	2-2-2	2-2-2	2-2-2	2-2-2
Memphis	Caldwell Elem.	2-1-2	2-2-2	2-2-2	2-2-2
Memphis	Cummings Elem.	2-1-2	2-2-2	2-2-2	1-1-1
Memphis	Double Tree Elem.	1-1-2	2-2-2	2-1-2	2-1-2
Memphis	Douglas Elem. Sch.	1-1-1	2-1-1	2-1-1	1-1-1
Memphis	Florida Elem. Sch.	1-1-1	1-2-1	1-1-1	1-1-1
Memphis	Goodlett Elem. Sch.	1-1-2	2-1-2	1-1-2	1-1-2
Memphis	Gordon Elem. Sch.	1-2-1	1-2-1	1-2-1	1-2-1
Memphis	Hanley Elem. Sch.	2-3-2	3-2-2	3-2-2	3-2-2
Memphis	A. B. Hill Elem. Sch.	2-1-2	2-2-2	2-2-2	2-1-2
Memphis	Kansas Elem. Sch.	1-1-1	1-1-1	1-1-1	2-0-1
Memphis	Larose Elem. Sch.	2-1-2	2-2-2	3-2-2	2-2-2
Memphis	Lester Demo. Sch.	4-3-2	2-2-2	2-1-2	2-1-2
Memphis	Lincoln Elem. Sch.	1-1-1	1-1-1	1-1-1	1-1-1
Memphis	Orleans Elem. Sch.	2-1-1	2-1-1	2-1-1	2-0-1
Memphis	Raineshaven Elem.	2-1-1	2-1-2	2-1-2	2-1-2
Memphis	Raleigh-Bartlett	2-1-1	1-2-1	2-1-1	2-1-1
Memphis	Riverview Elem.	2-3-2	2-3-2	2-2-3	2-2-2
Memphis	Snowden Elem.	2-1-1	Withdrawn	Withdrawn	Withdrawn
Memphis	Westside Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Memphis	Whitehaven Elem.	2-2-1	2-2-1	1-3-1	1-3-1
Montgomery	Montgomery Central	1-2-1	2-1-1	2-1-1	2-1-1
Obion	South Fulton Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Perry	Linden Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Pickett	Pickett Co. Elem.	1-1-1	1-1-1	1-2-1	1-2-1
Rhea	Spring City Elem.	2-1-2	2-2-2	2-1-2	2-1-2
Trenton	Trenton Elem.	2-1-2	2-2-2	Withdrawn	Withdrawn
Trousdale	Trousdale Co. Elem.	1-2-1	1-2-1	2-2-1	3-1-1
Tullahoma	East Lincoln Elem.	2-1-1	1-1-1	2-0-1	2-0-1
Unicoi	Unicoi Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Washington	Jonesborough Elem.	3-2-2	3-2-2	3-2-2	3-2-2
Washington	Boones Creek Elem.	2-2-1	2-2-1	2-2-1	2-2-1
Wayne	Collinwood Elem.	1-1-1	2-1-1	2-1-1	2-1-1
White	Findlay Elem.	1-2-1	2-2-1	2-1-1	2-1-1
Williamson	W. P. Scales Elem.	2-1-1	2-1-1	2-2-1	2-2-1
Wilson	Lakeview Elem.	2-1-2	2-1-2	2-2-2	2-2-2

Figure II - 1

Distribution of Schools Participating in

Project STAR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3

TABLE II-3

Number of Schools and Students by Location Kindergarten through Third Grade (1985-1989)

	Kindergarten (1985-86)		Grade 1 (1986-87)		Grade 2 (1987-88)		Grade 3 (1988-89)	
Location	Students	Schools	Students	Schools	Students	Schools	Students	Schools
Rural	2918	39	3240	38	3168	38	3239	38
Urban	568	8	686	8	482	7	506	7
Suburban	1414	16	1589	15	1711	15	1722	15
Inner City	1428	17	1380	15	1485	15	1336	15
Total	**6328**	**79**	**6835**	**76**	**6846**	**75**	**6804**	**75**

E. Data Collection Instruments

Project personnel collected information (data) about student achievement and development and about variables other than class size that might affect achievement. This included collecting information about instructional processes to try to understand how reduced class size effects and reduced student-adult ratio effects occurred. These effects were examined over time in relation to students, teachers and teacher aides. The impact of reduced class size and reduced student-adult ratio was assessed through multiple measures of student achievement and development and process measures such as activity logs, classroom observation, etc.

1. Tests

a. Stanford Achievement Test (SAT)

Students were tested each spring on the dates specified by the state. In each grade, the appropriate level of SAT was administered to all project STAR students and to students in 21 comparison schools. The norm-referenced SATs cover reading, math, spelling, listening, and in the higher grades science and social science, and provide subscores for both reading and math (The Psychological Corporation, Harcourt Brace Jovanovich, Inc., 1985).

b. Tennessee's Basic Skills First Test (BSF)

The State developed Basic Skills Criterion Tests for the third, sixth and eighth grades in reading and math in 1984. Because the SAT does not cover all of the curriculum taught, and the curriculum does not cover everything that is tested, Project STAR contracted with the State Testing Service to develop STAR Criterion Tests in reading and math to cover BSF learning objectives in grades one and two. These tests were similar to the already developed third grade test. The BSF learning objectives were the criteria tested. The untimed tests consist of multiple choice items, four items per objective, and are designed so that they can be administered in about an hour. (Tennessee Department of Education, 1987).

c. Self-Concept and Motivation Inventory

In addition to the SAT and BSF tests, students completed a self-concept and motivation inventory, the SCAMIN (Person-O-Metrics, Inc., 1967,1968). The SCAMIN asks students to indicate pictorially their response to 24 situations. For example what "face" (i.e. happy, sad, indifferent, etc.) would the student wear if he/she "had to tell his/her parents they lost their coat." The SCAMIN was selected because it is group administered, has forms appropriate for grades K-3, measures elements of self-concept of concern to this project, and requires no special training for administration. While it has only moderate reliability for the early grades, the SCAMIN is useful for comparing groups, such as small classes with regular classes (Davis and Johnston, et al.).

2. Additional Data Collection Instruments

Appendix C includes a copy of each of the following STAR data collection instruments:

a. **School and System Profile**- In order to get an overall picture of each school, principals completed this form which asked for such variables as school enrollment, average daily attendance, average daily membership, Chapter I eligibility, the percentage of students on free lunch, the percentage of students bussed, a breakdown of students by race and total expenditure per student.

b. **Principal Profile**- provided demographics on the individual principals, i.e., sex, race, education, experience, etc.

c. **Teacher Profile**- provided background information including college attended and level of education, certification, amount of teaching experience, type of in-service training completed, career ladder level, sex and race.

d. **Teacher Log**- recorded the time spent on typical daily activities which included routine paper work, student activities, small group, whole group, and individualized instruction, planning and preparation time, and personal time.

e. **Grouping Questionnaire**- recorded the number of small groups teachers created within their classes for instruction in reading, math, science, and social science, the average number of minutes spent each week in small group instruction and the criteria used for assigning students to instructional groups.

f. **Parent/Volunteer/Teacher Interaction Questionnaire**- provided the number of times during a four-week period that teachers communicated with parents about the performance or behavior of students or about general classroom activities. Modes of interaction included in person, by phone, or written contact. The quantity and quality of assistance were also noted, including the type of assistance and number of times that assistance was received from a volunteer or BSF aide.

g. **Teacher Problem Checklist**- indicated the frequency and extent to which teachers were bothered by 61 problems they were likely to encounter. The problems related to their responsibilities to students, their relationships with staff, administrators, and parents, the use of their time, and their professional growth (Cruickshank, D.R., 1980).

h. **Exit Interview**- Teachers were interviewed "in-person" at the end of the school year. These interviews allowed the teacher to describe differences between teaching in a small class or teaching with a full-time aide and teaching in a regular class. This open-ended interview gave the teachers an opportunity to express their feelings and experiences. The kindergarten interview (1985-86) was unstructured since its primary purposes were to get overall reflections of teachers about their teaching experiences, to thank participants and to serve a public relations function. The interviews provided some important and useful subjective and context data. Based upon an analysis of the first year's interview experience, the researchers developed a more highly structured interview format for subsequent years.

i. **Aide Profile**- provided information on full-time aides which included education, experience, teaching experience, teaching certification, sex and race.

j. **Aide Questionnaire**- provided information about an aide's interaction with his/her assigned project STAR teacher. In addition the specific types of daily tasks (e.g., bus duty, lunch duty, teaching lessons, giving tests, etc.) and the amount of time spent on these tasks were reported.

k. **Aide Log**- provided information about the time full-time aides spent on various generalized categories of activities during a typical day. The activities are the same as the ones described previously under the **Teacher Log** heading.

l. **Roster**- provided student demographic information such as sex, race, and birthday. Also, at the end of the school year, attendance, promotion, and free-lunch status were reported on the roster.

m. **Special Programs Form**- identified students who left their classes to participate in special programs such as Chapter I, Special Education, Language Development, Gifted programs, etc. The average amount of time students spent each week in these programs was also recorded.

Based on the data collected in kindergarten, some forms were modified to make them easier to process, and some forms were redesigned in other ways. Some new instruments were devised to collect additional data. These changes did not affect the basic study design but did improve data collection and processing.

Further information regarding testing or data collection instruments may be obtained from the Assistant Commissioner of Curriculum and Instruction, Tennessee State Department of Education, Cordell Hull Building, Fourth Floor North, Nashville, Tennessee 37243-0379.

F. General Description of Key Variables for Analysis

1. Outcome Variables:

a. Stanford Achievement Tests (SESAT II, Primary I, Primary II, Primary III)
b. SCAMIN Self-Concept and Motivation Subscores
c. Promotion/Retention
d. Attendance
e. Teacher Problem Checklist
f. Basic Skills Criterion Tests in Reading & Math (Grades 1,2,3)

Key Variables Cont.

2. **Student Variables:**
    - a. Age
    - b. Sex
    - c. Race
    - d. Free Lunch (SES Variable)
    - e. Project Entry Date
    - f. Total Years in STAR

3. **School Variable**: School Type (Inner City/Rural/Urban/Suburban)

4. **Classroom Variables**:
    - a. Class Type (Small/Regular/Regular with Aide)
    - b. Average Weekly Volunteer Time
    - c. Grouping Practices
    - d. Parent-Teacher Interaction

5. **Teacher Variables**:
    - a. Teaching Experience (total, at grade level, in this school)
    - b. Education Level
    - c. Certificates Held
    - d. Age (available for K only)
    - e. Race
    - f. Sex
    - g. Instructional Time

6. **Teacher Aide Variables**:
    - a. Years of Experience as an Aide
    - b. Race
    - c. Sex
    - d. Age (available for K only)
    - e. Use of Time

7. **Comparisons:**
    - a. Between/Among Class Conditions and School Types
    - b. With Comparison Schools
    - c. With Selected State Averages
    - d. Within Conditions

G. Methodology (Primary Analysis)

Project STAR's primary analysis consisted of a cross-sectional analysis of data from all students participating in project classes at each grade level, and two longitudinal analyses. For the latter, data were analyzed for students who were in the project in the same class type for four consecutive years (K-I-2-3). Analyses-of-variance procedures were employed to address the major questions of the study as follows:

(1) Class Type (Small/Regular/Aide) was assumed to be a fixed dimension; mean differences among class types comprise the most important question of the investigation.

(2) School Type (Inner City/ Urban/ Suburban/ Rural) was assumed to be a fixed dimension, crossed with class type.

(3) Schools were treated as a random dimension, nested within locations, but crossed with class type, since all three class types were present in each school. This is an important aspect of the design to account for the influence of shared conditions on all project classes within a school.

(4) Classes were treated as a random dimension when there were more than one class of a given type within a particular school.

(5) Students were treated as a random sample, nested within each class. A diagram of the complete design is shown in Figure II-2.

When all of the main effects and interactions of these factors are assembled into an analysis-of-variance model and expected mean squares evaluated, the resulting tests of significance are those given in Table II-4.

TABLE II-4

Analysis of Variance Source Table

Source of Variation	Error Term
Fixed effects:	
Location	Schools
Class Type	Location X Class
Type	Schools X Class Types
Random Effects:	
Schools	
Schools X Class Types	
Classes	
Students	

Figure II-2
A Diagram Of The Project STAR Research Design: Individual Classes By Class Type Within Schools By Location

LOCATION	Schools	TYPE OF CLASS		
		SMALL	REGULAR	REGULAR / AIDE
INNER-CITY	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			
SUBURBAN	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			
RURAL	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			
URBAN	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			

Since the error terms needed to test the significance of the fixed effects in the data are variation attributable to Schools and the School-X-Type interaction, student-level data were not required for this portion of the STAR analysis. Thus, data were aggregated to the level of class means before the analysis was conducted, to reduce the magnitude of statistical computations. Table II-4 also shows that the correct error degrees of freedom for the primary questions of the study are proportional to the number of schools -- in the neighborhood of 75 for some tests and 150 for others -- and not the number of students. The exact degrees of freedom for each computer run was affected slightly by the pattern of missing data on the particular instrument.

A parallel analysis was conducted with sex (grades K and 1 only) and race (all grades) as an additional factor of classification. Since both males and females are present in each class and, potentially, both white and minority students, these factors were treated as fixed effects, crossed with all other dimensions in the design. The error terms for treating sex, Sex-X-Location, Sex-X-Type, and Sex-X-Location-X-Type are Schools-X-Sex, Schools-X-Sex-X-Location, Schools-X-Sex-X-Type and Schools-X-Sex-X-Location-X-Type, respectively. For these tests means of all males and all females in each class, or all white and all minority students in each class were used as the units of analysis. Race and Sex were analyzed in parallel computer runs, so that no analysis of both factors simultaneously was conducted.*

The design has unequal **N's** and many empty cells. A general linear model approach for nonorthogonal designs was employed, using the MULTIVARIANCE computer program (Finn and Bock, 1985).

In each year, data from the measurement instruments were analyzed in subsets: the SAT achievement scales, the BSF performance tests (beginning in grade 1), and the SCAMIN self-concept and motivation scales. Since the measures are intercorrelated, multivariate test statistics (Wilks' likelihood ratios) were employed for each subset.

Once a significant main effect or interaction was found, two findings were examined: (A) A univariate test of significance for each scale separately; as follow-up procedure, these are termed "protected" tests; (B) Two orthogonal comparisons among Class Types, when the Class Type effect was found to be significant. The two particular contrasts used were (1) Small Class Means - (Regular + Regular with aide class means)/2 and (2) Regular with aide Class Means - Regular Class Means. The first (1) was selected because no mean differences were found between Regular and Teacher Aide classes in kindergarten, and because children were exchanged between these two Class Types before entering grade 1. The comparison of Small Classes with the average of the other two is not confounded by this procedural modification.

The two contrasts were examined in multivariate form for the entire subset of measures (Hotelling's T^2) and in univariate form for each scale separately (t-tests), but only after an overall test was found to be significant. Again, this is a "protected" procedure. Finally, effect size measures were computed from these contrasts, to reveal the magnitude of the effect (e.g., what impact did reducing the class size really make?).

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*This decision was made because means of all white males, minority males, white females and minority females would be based on very small and unreliable groups of youngsters. Also, the magnitude of a combined analysis would be unwieldy.

Prior to all analyses, the distributions of the criterion measures were examined for skewness and outliers. This resulted in only a few deletions of data that were obviously erroneous, and a rescaling of the BSF reading and mathematics scale. Individual students were scored as pass or fail, based on whether or not they passed 80 percent of the objectives covered on the respective test. At the class level, the percentage of students passing each test was obtained (P). Since these were not normally distributed, a "log-odds index" was obtained for each class, ln(P/100-P).

The distribution of the index was normal and used for tests of significance. Descriptive tables in this report, however, give BSF results just as average percent of objectives mastered.

The longitudinal analysis used the same basic design, but in a "repeated measures" form, and with just that subset of students who were in the same experimental condition for three consecutive years. The dependent variables were differences in mean performance between K and grade 1 and between grade 1 and 2; in the second longitudinal analysis, they were differences between grade 1 and 2 and between 2 and 3. Only the SAT measures were scaled as to permit grade-to-grade comparisons of this sort.

The original three years of data are intercorrelated, because they are obtained on the same individuals over time. As a result, the two difference scores are correlated as well. Thus, multivariate repeated measures analyses were used to control statistical errors, in the manner described by Bock (1975). Individual year-to-year growth was examined, or its interaction with other corresponding factors in the design, only when the corresponding overall test was statistically significant.

While the global analyses used the procedures outlined above, other more specific analyses employed a variety of statistical methodologies. These are described in the following chapters of the report, together with the results that were obtained. The analysis procedures employed were conservative and should have provided significant results only when there were considerable differences.

III. Descriptive Data and Teacher Effectiveness

A. Descriptive Characteristics

Descriptive data were collected in the beginning of each school year on profiles of each school and system, principal, teacher, and teacher aide participating in Project STAR (See Appendix C for profile instruments.) This section contains information obtained from descriptive data collected across the four years of the study.

1. School and System Profile Data

Completed STAR school and system profiles contain information on school enrollment, average daily attendance (ADA) and average daily membership (ADM), Chapter I eligibility, percent of free/reduced lunch, percent of students bussed, percent of race, grade span, system enrollment, total expenditure per pupil and location in the state. STAR schools were located in the eastern (n=21), the middle (n=33), and the western (n=25) portions of the state. Support for STAR was provided by four universities in Tennessee: University of Tennessee, Knoxville personnel worked with 21 schools in East Tennessee, Memphis State University with 25 schools in West Tennessee, Tennessee State University with 20 schools and Vanderbilt University with 13 schools in Middle Tennessee. The project schools were in school systems of all sizes. Table III-1 shows the STAR schools classified by system size. ADA figures for kindergarten through third grade are shown in Table III-2. ADM figures are shown in Table III-3.

Out of a total of 79 schools in STAR kindergarten, 64 were eligible for Chapter I and 15 were not. Out of a total of 76 during the STAR first grade year, 63 were eligible for Chapter I and 13 were not. Out of 75 in the second grade year, 66 were eligible and 9 were not. In the third grade year, out of a total of 75, 62 were and 13 were not eligible for Chapter I.

TABLE III-1

Number of Schools by System Size (Number of Students) and by Grade Project STAR (1985-89)

	Number of Schools			
	Kindergarten	1st Grade	2nd Grade	3rd Grade
System Size (Student Enrollment)				
Under 1,000	1	1	3	2
1,001 - 5,000	27	26	24	27
5,001 - 10,000	18	16	16	14
10,001 - 100,000	13	14	13	13
100,001 - 107,000	20	19	19	19
Total Number of Schools	**79**	**76**	**75**	**75**

TABLE III-2

STAR Average Daily Attendance (ADA) of Students by Number of Schools and by Grade* (1986-89)

	Number of Schools		
ADA	1st Grade	2nd Grade	3rd Grade
Under 400 Students	11	10	9
401-500 Students	21	16	14
501-700 Students	31	34	38
701-1,000 Students	13	15	14
Total Number of Schools	**76**	**75**	**75**

*This information was not collected during Kindergarten (1985).

TABLE III-3

STAR Average Daily Membership (ADM) of Students by Number of Schools and by Grade* (1986-89)

	Number of Schools		
ADM	1st Grade	2nd Grade	3rd Grade
Under 400 Students	10	8	7
401-500 Students	16	13	12
501-600 Students	15	22	24
601-700 Students	20	17	17
701-1,000 Students	15	15	15
Total Number of Schools	**76**	**75**	**75**

*This information was not collected during kindergarten (1985).

The percentage of students on free/reduced lunch was divided into two categories: 1) schools with 50 percent or less of their students on free/reduced lunch and 2) schools with more than 50 percent of their students on free/reduced lunch. The percent of students on free/reduced lunch for each year of the study is shown in Table III-4.

TABLE III-4

Percent of Students on Free/Reduced Lunch by Number of Schools and by Grade Project STAR (1985-89)

Percent of Students on Free/Reduced Lunch	Number of Schools Kindergarten	1st Grade	2nd Grade	3rd Grade
50% Or Less	55	46	49	44
More Than 50%	24	30	26	31
Total Number of Schools	**79**	**76**	**75**	**75**

In the Project STAR kindergarten year, 32 schools had 50 percent or fewer students bussed and 47 had over 50 percent bussed. Out of a total of 76 schools in the first grade year, 33 had 50 percent or fewer students bussed and 43 had over 50 percent bussed. In second grade, out of a total of 75, 30 schools had 50 percent or fewer students bussed and 45 had over 50 percent bussed. In third grade, 29 schools had 50 percent or fewer students bussed and 46 had over 50 percent bussed.

The percent of race by school was reported according to white students, black, Asian, Hispanic, American Indian, and "Other." In the kindergarten year, out of 79 schools, 19 had 50 percent or fewer white students, and 60 had over 50 percent; 60 had 50 percent or fewer black students and 19 had over 50 percent; all schools had less than 2 percent Asian, Hispanic and American Indians. In the first grade, out of 76 schools, 18 had 50 percent or fewer white students and 58 had over 50 percent; 58 had 50 percent or fewer black students and 18 had over 50 percent; and all had 3 percent or less Asian, 1 percent or less Hispanic, no American Indians and 1 percent or less "Other." In the second grade, out of 75 schools, 20 had 50 percent or fewer white students and 55 had over 50 percent; 56 had 50 percent or fewer and 19 had over 50 percent black students; and all had 2 percent or less Asian, 6 percent or less Hispanic, 1 percent or less American Indians, and 3 percent or less "Other." In the third grade, out of 75 schools, 19 had 50 percent or fewer white students and 56 had over 50 percent; 56 had 50 percent or fewer black students and 19 had over 50 percent; and all had 3 percent or less Asian, 5 percent or less Hispanic, 2 percent or less American Indians, and 1 percent or less "Other."

The grade span for the majority of STAR schools ranged from kindergarten through sixth grade for all four project years, although some schools had a grade span of kindergarten through ninth grade. The average total expenditure per student for the STAR kindergarten year was $2,035.07; for the first grade year, $2,218.40; for the second grade year, $2,356.56; and for the third grade year, $2,641.71.

2. Principal Profile Data

All Project STAR principals completed principal profiles: 79 in kindergarten (1985-86), 76 in first grade (1986-87), 75 in second grade (1987-88) and 75 in third grade (1988-89). Principal profiles included information on principal sex, race, college or university attended, teacher certification, teaching experience, administrative experience and career ladder level.

The number of female principals in the kindergarten year was 18 and male was 61 out of a total of 79. In first grade, female principals numbered 21 and males 55 out of 76. Female principals in second grade numbered 22 and males 53 out of 75. During the third grade year, 23 principals were female and 52 principals were male out of 75.

Out of a total of 79 principals in kindergarten, 18 were non-white (NW) and 61 were white (W). Sixteen principals were NW and 60 were W out of 76 in the first grade. In both the second and third grades, 17 were NW and 58 were W out of a total of 75 principals.

Principals' college/university degrees earned included bachelor's (B.S./ B.A.), master's (M.A./ M.S./ M.Ed.), second master's, specialist (Ed.S.) and doctorate (Ph.D./ Ed.D.). All principals had earned at least a bachelor's degree. Out of 79 principals in the kindergarten year, 17 reported having earned an Ed.S. or Ph.D./Ed.D. Sixteen STAR principals in the first grade reported having received an Ed.S. or Ph.D./Ed.D., 19 in the second grade, and 16 in the third grade year. The colleges/universities having five or more STAR principals as graduates were LeMoyne-Owen College, Memphis State University, Middle Tennessee State University, Tennessee State University and Tennessee Technological University.

All STAR principals were certified to teach. In the kindergarten year, 26 principals had from 0 to 10 years of teaching experience; 28 had from 11 to 20 years; 18 had from 21-30; and 6 had over 30 years. Forty-one STAR principals in the first grade year reported having 0 to 10 years of experience; 27 had 11 to 20 years; 5 had 21 to 30 years; and 3 had over 30 years. In the second grade year, 36 principals had 0 to 10 years of teaching experience; 36 had 11 to 20; and 2 had 21 to 30 years. Thirty-nine principals in third grade had 0 to 10 years of teaching experience; 29 had 11 to 20 years; 5 had 21 to 30; and 1 had over 30 years.

All STAR principals were certified as administrators except for one in the kindergarten year. In kindergarten 34 principals had from 0 to 10 years of administrator experience; 32 had 11 to 20 years; 12 had 21 to 30 years; and 1 had over 30 years. Thirty-seven principals in first grade had from 0 to 10 years of administrator experience; 28 had from 11 to 20 years; and 11 had from 21 to 30 years. In second grade, 39 principals had 0 to 10 years of administrator experience; 27 had from 11 to 20 years; 8 had from 21 to 30 years; and 1 had over 30 years. Thirty-four STAR principals in third grade had from 0 to 10 years of administrator experience, 27 had from 11 to 20 years; and 14 had 21 to 30 years.

STAR principal participation in career ladder was categorized as follows: not on career ladder; on level one; on level two; on level three; and pending. In the kindergarten year, 13 principals were on level one, 2 were on level two, and 31 were pending. Fourteen first grade principals were not on career ladder, 31 were on level one, 4 were on level two, 20 were on level three, and 7 were pending. In second grade, 12 principals were not on career ladder, 29 were on level one, 4 were on level two, and 30 were on level three. In the third grade year, 9 principals were not on career ladder, 30 were on level one, 7 were on level two, and 29 were on level three.

3. Teacher Profile Data

Each STAR teacher completed a teacher profile. Self-reported data included class type, teacher sex, race, college or university attended, degree(s) earned, certification, teaching experience, in-service training (within the last two years), and career ladder level. Table III-5 shows the number of teachers in school types by class types. A total of 339 teachers in kindergarten, 350 in first grade, 344 in second, and 334 in third grade completed teacher profiles.

Table III-6 shows the number of teachers by sex and class type for each year of the study. In kindergarten, there were no male teachers. There were 348 females and 2 male teachers in the first grade, 341 females and 3 males in the second grade, and 323 females and 11 males in the third grade.

In STAR kindergarten, of 339 total teachers, 55 were non-white (NW) and 284 were white (W). In first grade, 64 were NW and 286 were W out of a total of 350 teachers. In second grade, 72 teachers were NW and 272 were W out of a total of 344. In the third grade year, 71 teachers were NW and 263 were white out of a total of 334. The number of STAR teachers by race and class type is shown in Table III-7.

Every STAR teacher had at least a bachelor's degree. Table III-8 shows the number of STAR teachers holding degrees compared to class size. Table III-9 shows the number earning a bachelor's degree from colleges or universities that had ten or more graduates teaching in STAR.

All teachers, during each year of the study, were certified to teach at the appropriate grade level. Project STAR teachers reported from 0 to over 40 years of teaching experience. Table III-10 shows the total number of years of teaching experience by class type.

STAR teachers reported which types (TIMS, reading workshop, math workshop, classroom management, career ladder, taking college courses) of in-service training they had or had not completed during the past two years. The number of teachers completing selected in-service training sessions by class type is shown in Table III-11.

Some STAR teachers (K-3) reported having completed career ladder level one, level two, level three or other. Teacher career ladder levels by class types are shown in Table III-12.

TABLE III-5

Number of Teachers by School Type, Class Type and Grade Project STAR (1985-89)

Kindergarten 1985-86

School Type	Small	Regular	Regular/Aide	Total
Inner City	28	27	23	78
Suburban	31	20	23	74
Rural	59	52	44	155
Urban	13	8	11	32
Total	**131**	**107**	**101**	**339**

First Grade 1986-87

School Type	Small	Regular	Regular/Aide	Total
Inner City	25	27	23	75
Suburban	28	29	24	81
Rural	62	51	50	163
Urban	12	9	10	31
Total	**127**	**116**	**107**	**350**

Second Grade 1987-88

School Type	Small	Regular	Regular/Aide	Total
Inner City	27	22	24	73
Suburban	31	25	26	82
Rural	64	47	48	159
Urban	13	6	11	30
Total	**135**	**100**	**109**	**344**

Third Grade 1988-89

School Type	Small	Regular	Regular/Aide	Total
Inner City	26	19	22	67
Suburban	32	22	25	79
Rural	69	42	48	159
Urban	13	6	10	29
Total	**140**	**89**	**105**	**334**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

TABLE III-6

Number of Project STAR Teachers by Sex and Class Type (1985-89)

Kindergarten 1985-86

Class Type	Female	%	Male	%	Total	%
Small	131	38.6	0	0.0	131	38.6
Regular	107	31.6	0	0.0	107	31.6
Regular/Aide	101	29.8	0	0.0	101	29.8
Total	**339**	**100.0**	**0**	**0.0**	**339**	**100.0**

First Grade 1986-87

Class Type	Female	%	Male	%	Total	%
Small	125	35.9	2	0.0	127	36.3
Regular	116	33.3	0	0.0	116	33.1
Regular/Aide	107	30.7	0	0.0	107	30.6
Total	**348**	**99.4**	**2**	**0.6**	**350**	**100.0**

Second Grade 1987-88

Class Type	Female	%	Male	%	Total	%
Small	135	39.6	0	0.0	135	39.2
Regular	99	29.0	1	33.3	100	29.1
Regular/Aide	107	31.4	2	66.7	109	31.7
Total	**341**	**99.1**	**3**	**0.9**	**344**	**100.0**

Third Grade 1988-89

Class Type	Female	%	Male	%	Total	%
Small	135	41.8	5	45.5	140	41.9
Regular	85	26.3	4	36.4	89	26.6
Regular/Aide	103	31.9	2	18.2	105	31.4
Total	**323**	**96.7**	**11**	**3.3**	**334**	**100.0**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

TABLE III-7

Number of Project STAR Teachers by Race and Class Type (1985-89)

Kindergarten 1985-86

Class Type	Non-White	%	White	%	Total	%
Small	17	30.9	114	40.1	131	38.6
Regular	22	40.0	85	29.9	107	31.6
Regular/Aide	16	29.1	85	29.9	101	29.8
Total	**55**	**16.2**	**284**	**84.0**	**339**	**100.0**

First Grade 1986-87

Class Type	Non-White	%	White	%	Total	%
Small	22	34.4	105	36.7	127	36.3
Regular	19	29.7	97	33.9	116	33.1
Regular/Aide	23	35.9	84	29.4	107	30.6
Total	**64**	**18.3**	**286**	**81.7**	**350**	**100.0**

Second Grade 1987-88

Class Type	Non-White	%	White	%	Total	%
Small	27	37.5	108	39.7	135	39.2
Regular	23	31.9	77	28.3	100	29.1
Regular/Aide	22	30.6	87	32.0	109	31.7
Total	**72**	**20.9**	**272**	**79.1**	**344**	**100.0**

Third Grade 1988-89

Class Type	Non-White	%	White	%	Total	%
Small	31	43.7	109	41.4	140	41.9
Regular	18	25.7	71	27.0	89	26.6
Regular/Aide	22	31.4	83	31.6	105	31.4
Total	**71**	**21.0**	**263**	**78.7**	**334**	**100.0**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

TABLE III-8

STAR Teachers' Highest College/University Degrees Earned by Class Type and by Grade (1985-89)*

Kindergarten 1985-86

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	87	71	63	221
Master's	41	36	38	115
Specialist	3	0	0	3
Doctorate	0	0	0	0
Total	**131**	**107**	**101**	**339**

First Grade 1986-87

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	82	79	63	224
Master's	44	37	42	123
Specialist	1	0	1	2
Doctorate	0	0	1	1
Total	**127**	**116**	**107**	**350**

Second Grade 1987-88

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	90	67	63	220
Master's	43	32	44	119
Specialist	1	1	1	3
Doctorate	1	0	1	2
Total	**135**	**100**	**109**	**344**

Third Grade 1988-89

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	89	51	51	191
Master's	50	37	52	139
Specialist	1	1	2	4
Doctorate	0	0	0	0
Total	**140**	**89**	**105**	**334**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

Table III-9

Colleges/Universities Attended by Ten or More STAR Teachers by Project Grade and by Class Type

Kindergarten 1985-86	Small	Regular	Regular/Aide	Total
Austin Peay State Univ.	5	4	2	11
LeMoyne-Owen College	3	11	7	21
Memphis State Univ.	16	9	11	36
Middle Tenn. State Univ.	15	7	13	35
Tenn. Tech. Univ.	18	7	8	33
UT - Martin	6	4	3	13
East Tenn. State Univ.	6	7	2	15
UT - Knoxville	12	14	9	35

First Grade 1986-87	Small	Regular	Regular/Aide	Total
LeMoyne-Owen College	9	5	6	20
Lincoln Memorial Univ.	2	3	5	10
Memphis State Univ.	9	12	5	26
Middle Tenn. State Univ.	19	12	14	45
Tenn. State Univ.	2	3	5	10
Tenn. Tech. Univ.	11	10	12	33
UT - Knoxville	11	12	9	32
UT - Martin	7	6	11	24

Second Grade 1987-88	Small	Regular	Regular/Aide	Total
Austin Peay State Univ.	4	1	5	10
Carson-Newman College	5	2	4	11
East Tenn. State Univ.	8	4	6	18
LeMoyne-Owen College	11	9	8	28
Memphis State Univ.	6	10	11	27
Middle Tenn. State Univ.	20	5	15	40
Tenn. State Univ.	4	3	4	11
Tenn. Tech. Univ.	14	9	10	33
UT - Knoxville	13	7	5	25
UT - Martin	6	7	6	19

Third Grade 1988-89	Small	Regular	Regular/Aide	Total
East Tenn. State Univ.	6	7	4	17
LeMoyne-Owen Univ.	11	6	8	25
Memphis State Univ.	8	5	8	21
Middle Tenn. State Univ.	15	8	12	35
Tenn. State Univ.	3	4	4	11
Tenn. Tech. Univ.	14	11	6	31
UT - Knoxville	12	8	7	27
UT - Martin	4	3	3	10

TABLE III-10

STAR Teachers' Total Years Teaching Experience by Project Grade (1985-1989) and by Class Type

Years Experience	Kindergarten*			First Grade		
	Small	Regular	Regular/Aide	Small	Regular	Regular/Aide
0-9	72	59	48	57	61	46
10-19	50	42	45	47	38	37
20-29	9	6	7	15	12	18
30-39	0	0	0	8	4	6
40+	0	0	0	0	1	0

Years Experience	Second Grade*			Third Grade		
	Small	Regular	Regular/Aide	Small	Regular	Regular/Aide
0-9	50	40	37	53	35	30
10-19	59	42	45	58	30	52
20-29	18	11	15	19	21	15
30-39	8	6	10	10	3	8
40+	0	1	0	0	0	0

*One kindergarten and 2 second grade teachers did not provide this information.

TABLE III-11

Number of Teachers Completing Selected In-service Training by Grade and by Class Type

First Grade 1986-87

In-service Choices	Small	Regular	Regular/Aide	Total
TIMS	80	68	69	217
Math Workshop	48	41	40	129
Reading Workshop	67	55	52	174
Classroom Management	60	54	57	171
Career Ladder Workshop	51	47	47	145
Taking College Courses	57	45	45	147
Second Grade 1987-88				
TIMS	71	50	55	176
Math Workshop	66	51	57	174
Reading Workshop	71	60	56	187
Classroom Management	67	61	62	190
Career Ladder Workshop	63	44	52	159
Taking College Courses	59	47	43	149
Third Grade 1988-89				
TIMS	55	37	43	135
Math Workshop	69	41	44	154
Reading Workshop	83	45	55	183
Classroom Management	86	54	61	201
Career Ladder Workshop	45	41	40	126
Taking College Courses	69	33	48	150

TABLE III-12

STAR Teacher Career Ladder Levels by Class Type and by Grade (1985-89)

Kindergarten 1985-86

	Small	Regular	Regular/Aide	Total
Level I	96	70	80	246
Level II	2	2	2	6
Level III	1	2	0	3
Non-Career Ladder*	19	20	11	50
Total	**118**	**94**	**93**	**305****

First Grade 1986-87

	Small	Regular	Regular/Aide	Total
Level I	87	73	72	232
Level II	2	0	4	6
Level III	8	4	3	15
Non-Career Ladder*	30	38	28	96
Total	**127**	**115**	**107**	**349****

Second Grade 1987-88

	Small	Regular	Regular/Aide	Total
Level I	92	64	81	237
Level II	3	1	2	6
Level III	6	5	1	12
Non-Career Ladder*	33	30	23	86
Total	**134**	**100**	**107**	**341****

Third Grade 1988-89

	Small	Regular	Regular/Aide	Total
Level I	92	59	68	219
Level II	7	3	12	22
Level III	10	7	7	24
Non-Career Ladder*	31	20	18	69
Total	**140**	**89**	**105**	**334**

*Includes all teachers who were apprentice, probationary, pending, or not on Career Ladder.

**Thirty-four kindergarten, 1 first grade, and 3 second grade teachers did not provide this information.

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

4. Teacher Aide Profile Data

Self-reported descriptive data were collected from aides on background characteristics such as age, race, sex, experience as an aide, and educational level. Ninety-nine STAR kindergarten, 105 first grade, 106 second grade, and 106 third grade teachers were assigned full-time aides. All STAR aides were female with the exception of one male aide during third grade. Out of a total of 98 kindergarten aides, 30 were non-white (NW) and 68 were white (W). Out of a total of 105 first grade aides, 29 were NW and 76 were W. Out of 106 total second grade aides, 32 were NW and 74 were W. Out of a total of 106 third grade aides, 33 were NW and 73 were W.

During kindergarten, 97 teacher aides reported receiving a high school diploma. One hundred three aides in first grade had graduated from high school or received a GED, and only 1 had not. Out of 106 second grade aides, 104 had graduated and 2 had not. All 106 third grade STAR aides had graduated from high school.

Ten kindergarten aides had a bachelor's and 6 had associate degrees. Six first grade aides had bachelor's degrees and 1 had a master's degree. In second grade, 11 aides had bachelor's and 2 had master's degrees. Seven third grade aides had bachelor's degrees.

Out of 98 total kindergarten aides, 9 were and 89 were not certified to teach. Out of a total of 105 first grade aides, 3 were and 101 were not certified to teach. Four second grade aides were certified and 101 were not. Two third grade aides were certified and 103 were not.

In first grade 95 aides had 5 or fewer years of experience as an aide and 9 had from 6 to 21 years of experience. Ninety-three second grade aides had 5 or fewer years of experience and 13 had from 6 to 26 years of experience as an aide. Ninety-one third grade aides had 5 or fewer years of experience and 12 had from 6 to 26 years of experience as an aide.

During the STAR kindergarten year, 81 aides had no teaching experience, 5 had one year and the remaining 12 aides had between two and eight years of teaching experience. In the first grade year, six aides reported between one and three years of teaching experience. No STAR aides had over eight years of experience in the second grade year. During the STAR third grade year, seven aides had under 10 years of teaching experience and one aide had 19 years.

B. Teacher Effectiveness

1. Distribution of Top 10% of Classes in K-3

The question of small class effectiveness was also evaluated by looking at the class size of the top 10% of classes each year (Table III-13).

Table III-13

Number of Top 10% Classes from Project STAR Kindergarten through Third Grade: Stanford Total Reading Achievement

Grade	Small	Regular	Regular/Aide	Total
Kindergarten	18	10	5	33
1st Grade	22	5	7	34
2nd Grade	23	5	6	34
3rd Grade	25	2	5	32

The number of small classes in the top 10% increased each year. Eighteen of the top 33 kindergarten classes were small; 22 of the 34 first grade classes were small; 23 of the 34 second grade classes and 25 of the 32 third grade classes were small.

The scaled score average for the top ten percent small third grade classes was 649.3 which was 27 points above 622.3, the average scaled score for all of the third grade small classes.

The kindergarten top ten percent classes which included 18 small classes had scaled scores which ranged from 463 (75th percentile) to 494 (90th percentile). (See Table III-14.) The top percentile rank increased to the 93rd percentile in first grade and to the 96th percentile in second grade. It dropped back to the 90th percentile in third grade.

Table III-14

Scaled Scores and Percentile Ranks for Top 10 Percent Classes: Stanford Total Reading Achievement

Grade	Scaled Score	Percentile Rank*
Kindergarten	463 to 494	75th to 90th
First Grade	564 to 599	81st to 93rd
Second Grade	616 to 663	79th to 96th
Third Grade	642 to 669	76th to 90th

*Percentile Ranks Based on Multilevel Norms

2. First Grade Effective Teachers

The teaching practices, the materials used, and professional and personal characteristics of forty-nine effective teachers were studied to determine what effective teachers do to promote learning in reading and mathematics.

Did the classes with the highest scores make the greatest gain? In order to identify the classes with the greatest gains at the end of first grade the following procedure was used. Average student gains were computed by class type and in terms of scaled scores. (See Table III-15)

a. The outcome measures were the Stanford Achievement Tests, administered at the end of kindergarten (SESAT II) and first grade (Stanford Primary I). Composite scores for calculating scaled score gains for the 338 classes were derived as follows:

> (1.) The SESAT II Total Reading scores were averaged to obtain a class reading mean score. The SESAT II Total Math scores were averaged to obtain a class math mean score.
>
> (2.) The same procedures were used to calculate a class reading mean score and a class math mean score for the Stanford Primary I test administered at the end of first grade.
>
> (3.) The SESAT II class reading mean score was subtracted from the Primary I class reading mean score to provide a scaled score average gain in reading for each class. The same procedure was repeated for math.
>
> (4.) In order to obtain a scaled score average gain for each class, the reading mean gain and the math mean gain were averaged.
>
> (5.) The scaled score average gains were ranked within each school type category.
>
> (6.) The top 15% of each category was selected for this study.
>
> (7.) Teachers were chosen for observation /interview whose classes ranked in the top 15% of scaled score average gains for each of four school types: rural, urban, suburban, inner city.
>
> (8.) The distribution of class types taught by the effective teachers were 23 small (13-17); 8 regular (22-25); and 12 regular plus a full time instructional aide (22-25). Seven teachers' classes did not meet the specified requirements and are identified as Not in Design (18-21).

TABLE III-15

Average Class Gains in Scaled Scores by Class Type Project STAR Grade One (1987-88)

Total Reading	**Top 15%**			**Other 85%**		
Class Type	Kindergarten	Grade 1	Gain	Kindergarten	Grade 1	Gain
Small (13-17)	444	564	120	443	527	84
Regular (22-25)	443	554	111	439	515	76
Regular/Aide (22-25)	438	556	118	438	522	84

Total Math	**Top 15%**			**Other 85%**		
Class Type	Kindergarten	Grade 1	Gain	Kindergarten	Grade 1	Gain
Small (13-17)	444	564	120	443	527	84
Regular (22-25)	443	554	111	439	515	76
Regular/Aide (22-25)	438	556	118	438	522	84

b. Characteristics of Effective Teachers

For the teacher characteristics, the interview guide drew on personal characteristics summarized by the Educational Research Service. The characteristics included: preparation, certification, experience, in-service education, and family background.

The sample consisted of 50 females, of which 41 were white and 9 were black. The teachers' ages were in the following ranges: 25 to 34 (N=11), 35 to 44 (N=24), 45 to 54 (N=8), 55 to 64 (N=3), unknown (N=4) resulting in a median age of 38.5. Data collected on teacher preparation included BA/BS degree (N=32), MA/MS degree (N=18), full primary certification (N=50), teaching experience at the first grade level: less than 1 year (N=8), 1 to 5 years (N=12), 6 to 10 years

(N=12), 11 to 15 years (N=9), 16 to 20 years (N=5), 21+ years (N=4); total years of teaching experience: less than 1 year (N=2), 1 to 5 years (N=10), 6 to 10 years (N=13), 11 to 15 years (N=13), 16 to 20 years (N=5), 21+ years (N=7). In addition, in-service training completed within the past two years was reported as follows: Tennessee Instructional Model (N=36), Reading Workshop (N=23), Math Workshop (N=18), Classroom Management (N=23), Orientation to Career Ladder (N=16), College Courses (N=26). See Table III-16.

Thirty percent (N=19) chose teaching as a career when they were in elementary school 27% (N=13) made this choice in high school. While 18% (N=9) chose teaching during their college training, only 16% (N=8) made career changes in order to become teachers.

Fifty-seven percent (N=28) have other teachers in their families. Twenty-nine percent (N=14) are children of a teacher. Thirty-three percent (N=16) have one or more siblings who are in the teaching profession. Eight percent (N=4) are married to educators.

Eighty-six percent (N=42) of the effective teachers belong to a professional association, and 45 percent (N=22) work actively in the association.

C. Teaching Practices and Materials used by Effective Teachers

A procedure was established for documenting the effective teachers' teaching practices and use of materials. The procedure included both observation and interview.

An interview guide was designed based on the adaptation of Concepts of Effective Teaching delineated in "A Synthesis of Effective Schools Research" compiled by the Northwest Regional Educational Laboratory (Appendix D). Observer reliability was achieved by using paired observers who checked each other's independent judgement. Teachers were rated poor, fair, good, or excellent on each of the 12 criterion included in "A Synthesis of Effective Schools Research".

Six categories were developed to describe the practices used by effective teachers:

A. Preplanned Instruction
B. Expectations
C. Strategies for Accomplishing Expectations
D. Organization and Classroom Management
E. Personal Interaction
F. Family Involvement

(1) Preplanned Instruction

Instruction is guided by a preplanned curriculum which is adapted to the needs of students. The teachers use a broad range of resources and activities. Eighty-two percent of the effective teachers were rated excellent and 18% were rated good.

Table 4

Professional and Personal Characteristics of Teachers

Characteristics	Top 15% (N=50)	Other 85% (N=288)
Race: White	41 (82%)	238 (83%)
Black	9 (18%)	50 (17%)
Age: 25-34	11 (22%)	NA*
35-44	24 (48%)	
45-54	8 (16%)	
55-64	3 (6%)	
Missing	4 (8%)	
Preparation:		
B.A. or B.S.	32 (64%)	187 (65%)
M.A. or M.S.	18 (36%)	101 (35%)
Certification:		
Full Primary	50 (100%)	288 (100%)
Years of Teaching Experience at First Grade Level:		
Less than 1	8 (16%)	48 (17%)
1 to 5	12 (24%)	99 (34%)
6 to 10	12 (24%)	58 (20%)
11 to 15	9 (18%)	36 (13%)
16 to 20	5 (10%)	24 (8%)
21 or more	4 (8%)	23 (8%)
Total Year of Teaching Experience:		
Less than 1	2 (4%)	11 (4%)
1 to 5	10 (20%)	74 (26%)
6 to 10	13 (26%)	58 (20%)
11 to 15	13 (26%)	58 (20%)
16 to 20	5 (10%)	44 (15%)
21 or more	7 (14%)	43 (15%)
In-service Training Completed Within Last Two Years:		
Tennessee Instructional Model (TIM)	36 (72%)	173 (60%)
Reading Workshop	23 (46%)	145 (50%)
Mathematics Workshop	18 (36%)	105 (36%)
Classroom Management	23 (46%)	142 (49%)
Orientation to Career Ladder	16 (32%)	124 (43%)
College Courses	26 (52%)	116 (40%)

*Project STAR did not collect data on age.

(2) Expectations

The observer/interviewers (O/Is) determined that effective teachers had high expectations for student learning. O/Is ranked eighty percent of the 49 teachers excellent at setting expectations and twenty percent above average on a scale of 1-4 with 4 being the highest. On a scale of below average, average and above average, the majority of teachers stated that their class was either average (n=27) or above average (n=18).

Effective teachers set and maintain quality standards consistently. These teachers use a variety of strategies to assure that all students will be at the level of learning necessary to be successful in the next grade. The strategies mentioned most often were: parent involvement (n=18), individualization (n=18), use of teacher assistant where available (n=15), peer tutoring (n=12), and praise and encouragement (n=10).

(3) Strategies For Accomplishing Expectations

Effective teachers use a variety of teaching strategies which fall within the following general areas:

- (a) Orientation
- (b) Clear and focused instruction
- (c) Monitoring
- (d) Grouping
- (e) Reteaching
- (f) Incentives and Rewards
- (g) Learning Centers
- (h) Manipulatives

(4) Organization and Classroom Management

All of the teachers have a scheduled time for each subject and concentrate on using class time for learning. Ninety-four percent (N=46) of the teachers were evaluated as excellent on the efficiency of their classroom routines. Eighty-four percent (N=41) of the effective teachers have excellent standards for classroom behavior. These effective teachers who demonstrated excellent organizational skills had almost an hour more of teaching time per week for each math and reading.

(5) Personal Interaction

Eighty-four percent (N=41) maintained excellent personal interactions with the students. An additional 10% had good interactions with students. When asked how they let the students know that they really cared, through pats and hugs, group sharing time, one-on-one sharing time, and praise and other positive comments.

(6) Family Involvement

Effective teachers believe that the families of their students should be involved in the students' continuous learning process. These teachers believe in open communication between home and school by either telephone, notes, conferences, or quick chats when someone in the family comes to pickup the student after school. These teachers' beliefs are evidenced by the fact that 95% of them said that they encourage the families of their students to keep up with their progress in school.

Effective teachers involve the families of their students in other important ways. They invite the families to serve as volunteers at school. These teachers are able to explain to the families of their students the necessity of becoming involved in their learning in a variety of ways:

Listening to the students read at home.
Helping them with math by using flashcards or other manipulatives.
Checking their homework.
Eating lunch with them at school.
Various activities to keep them involved.

When these teachers were asked "What kinds of things do you do in order to prevent a student in your classroom from experiencing failure?", 37% said they involve the families of their students in the learning process in order to try to prevent failure.

It is often said that a child's parents are the first and foremost teachers. It appears that effective teachers believe this premise to be true.

E. Profile

A profile of the effective first grade teacher in this study reveals the following:

median age - 38.5 yrs.
education - BA/BS
median years of teaching experience - 10.5
median years of teaching experience at first grade - 8.0
K-3 certification
TIM trained
taking college courses
Level I of Tennessee Career Ladder
other educators in the family

These teachers consistently displayed similar affective qualities. Enthusiasm in the form of "acting", demonstrating, and role-playing activities on the part of the teacher was prominent. Having positive attitudes toward children, emphasizing positive behavior and praising success were observed as common. Having and using a sense of humor to promote learning and motivate students were often observed. Finally, "a love for children" seemed to permeate the entire professional repertoire in nearly all of the observations.

In addition to these common characteristics, class size appears to have been a contributing factor to the success of these fifty effective teachers. Only 8 (16%) had a regular class (22-25). Twenty-three (46%) had small classes (13-17); 7 (14%) had a class of 18-21 and 12 (24%) had a full time instructional aide. Additional material on first grade effective teachers and the complete findings on second and third grade effective teachers are reported in appendix D.

IV. PRIMARY FINDINGS

Effects of Small Classes and a Teacher Aide on Student Achievement and Self-Concept

A. Introduction

This chapter presents the results of the four cross-sectional analyses done at the end of each year, kindergarten through third grade. A similar format is used in each section; first reporting class type achievement differences as measured by the Stanford Achievement Test and the Tennessee Basic Skills First test, followed by a report of the class type differences on the SCAMIN Self-Concept. The final section of this chapter compares results for the one-year analyses across all four years.

The analysis in this chapter is based on Dr. Jeremy Finn's methodology described in chapter 2. This analysis was confirmed by other analyses that examined different subgroups of students who were included or excluded from the analysis.

B. Kindergarten

1. Description of the Data Base

In the first year every effort was made to look at the sample and to identify the similarities and differences that existed among systems, schools, teachers, and students. Selected characteristics of the sample (1985-86) are in Table IV-1 which shows the total numbers of schools, classes and students in STAR and those included in the analysis. The analysis of student achievement was limited to students in STAR for most of the year (entered by 11/1/85) and who had completed either the SESAT II math or reading subtests, or both. Analyses of student development (SCAMIN) required the student to have SCAMIN subtest scores. Table IV-1 shows that approximately 39 percent of the classes were Small, 31 percent were Regular and 30 percent were Regular with aide.

Analyses reported in this section are from test data collected for 5,734 students. Student data were divided into achievement and non-cognitive measures. Achievement measures were results on the SESAT II* (Math or M, Sounds and Letters or S&L, Words and Sentences or W&S, and Total Reading or TR). The non-cognitive measures were the two SCAMIN subscales (Motivation or MOT and Self-Concept or SC). The research tape included complete data for more students for achievement measures (5734) than for non-cognitive measures (4806). Tables IV-2 and IV-3 show the numbers of schools, classes and students by class type and location used in the analyses: IV-2 for Achievement and IV-3 for Non-cognitive Measures.

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*The consortium chose SESAT II over SESAT I for several reasons. Tennessee K objectives correlated better with SESAT II than SESAT I; some comparison schools already used SESAT II, and SESAT II offered a higher "ceiling." This resulted in some test-taking frustrations for some students and teachers. Students had difficulty with one section of the SESAT II (sentence reading) and this section was not used in the kindergarten analyses.

TABLE IV-1

Numbers of Districts, Schools, Kindergarten Students and Classes by Type: STAR (1985-86)

	Dist.	Sch.	Pupils	Classes							
				Small		Regular		Regular With Aide		Total	
1985-86 (K)	N	N	N	N	%	N	%	N	%	N	%
Total Project	42	79	6328	127	39	103	31	99	30	329	100
Data Used for K Analysis*	42	79	5734	127	39	103	31	98	30	328	100

*This includes students with required test scores who entered Kindergarten before November, 1985.

TABLE IV-2

Total Kindergarten Sample For Achievement Measures

Class Type					
Location/ and (N)	**Item**	**Small N**	**Regular N**	**Reg/Aide N**	**Total N**
Inner City (16)	Class	26	25	22	73
	Pupils	341	494	449	1284
Suburban (18)	Class	30	20	22	72
	Pupils	396	399	469	1264
Rural (38)	Class	59	51	45	155
	Pupils	787	1020	911	2718
Urban (6)	Class	12	7	9	28
	Pupils	154	136	178	468
Total (79)	**Class**	**127**	**103**	**98**	**328**
	Pupils	**1678**	**2049**	**2007**	**5734**

TABLE IV-3
Total Kindergarten Sample For Non-Cognitive Measures

Class Type Location/ and (N)	Item	Small N	Regular N	Reg/Aide N	Total N
Inner City (15)	Class	25	23	21	69
	Pupils	281	400	377	1058
Suburban (15)	Class	27	18	20	65
	Pupils	342	322	395	1059
Rural (37)	Class	56	49	42	147
	Pupils	704	893	769	2366
Urban (5)	Class	10	6	6	22
	Pupils	114	99	110	323
Total (73)	**Class**	**118**	**96**	**89**	**303**
	Pupils	**1441**	**1714**	**1659**	**4806**

2. Analyses of Kindergarten Class Size Effect

Data were collected at the individual level (students, teachers, etc.), but the classroom was the unit of analysis since the primary variable was class size. Class type was analyzed for its effect on four achievement measures, with controls for school location, sex, race, and student socioeconomic status or SES (as determined by free or reduced lunch).

The mean scores and transformed variance measures* for STAR students on four Achievement measures by class type appear in Tables IV-4. Similar data for the SCAMIN measures appear in Table IV-5. Scaled scores are shown for all achievement measures. Scaled scores cannot be compared across tests.

The small class mean was consistently higher than the regular or regular with aide mean on the achievement measures. On only 2 of 40 class mean score comparisons were small class scores lower than regular or regular/aide classes. The non-cognitive results (Table IV-5) are less definite, but the small class means exceed regular and regular/aide means in all but 6 of 20 comparisons. Thus, small classes outscored regular and regular/aide classes 95 percent of the time on achievement and 70 percent of the time on non-cognitive measures when considering class average scores grouped by school location.

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* Complete details of all analyses are in an Analysis Report prepared by Dr. Finn and available from the Tennessee State Department of Education. This report shows all data, mean scores, analyses, etc. Persons interested in the technical details of the analyses should review that report. Some results presented in other sections of this report are summarized from the Finn technical report without the accompanying tables.

TABLE IV-4

Mean Scale Scores for Achievement Measures and Class Variability Scores: STAR, 1985-86

Class	Math				Sounds/Letters				Words/Sent.				Total Read.			
Mean	S	R	RA	All	S	R	RA	All	S	R	RA	All	S	R	RA	All
Inner City	474.3	470.6	470.6	471.9	432.5	424.1	435.3	430.5	431.4	424.6	429.0	428.4	431.8	424.4	431.1	429.1
Suburban	491.7	494.9	487.0	491.1	454.2	451.9	445.3	450.8	443.2	435.3	433.9	438.2	447.6	441.0	438.6	443.0
Urban	495.3	482.3	479.3	486.9	459.3	455.4	447.9	454.7	444.1	440.6	437.7	441.1	449.0	445.5	441.5	445.7
Rural	492.3	482.2	484.8	486.8	445.1	438.4	439.4	441.2	437.7	434.8	435.0	436.0	440.6	436.3	436.7	438.0
Total	**488.8**	**481.9**	**481.6**	**---**	**446.0**	**438.7**	**440.6**	**---**	**438.3**	**432.8**	**433.7**	**---**	**441.2**	**435.0**	**436.3**	**---**
Class Variablity																
Inner City	3.45	3.37	3.20	NA	3.30	3.21	3.08	NA	2.63	2.59	2.61	NA	2.81	2.73	2.70	NA
Suburban	3.51	3.45	3.43	NA	3.29	3.32	3.26	NA	2.89	2.90	2.87	NA	2.95	2.96	2.92	NA
Urban	3.38	3.57	3.50	NA	3.24	3.28	3.22	NA	2.87	2.97	2.92	NA	2.89	3.01	2.95	NA
Rural	3.44	3.44	3.42	NA	3.25	3.30	3.27	NA	2.87	2.82	2.91	NA	2.93	2.93	2.95	NA
Total	**3.45**	**3.43**	**3.38**	**NA**	**3.27**	**3.28**	**3.22**	**NA**	**2.82**	**2.79**	**2.84**	**NA**	**2.91**	**2.89**	**2.89**	**NA**

TABLE IV-5

Mean Raw Scores for Kindergarten (SCAMIN) by Class type and Location: STAR, 1985-86

Class		Motivation			Self-Concept	
Means	**Small**	**Regular**	**Regular/Aide**	**Small**	**Regular**	**Regular/Aide**
Inner C.	25.99	25.96	25.45	31.28	30.12	30.09
Suburban	25.48	25.40	25.64	30.39	30.07	30.29
Urban	25.58	25.67	25.65	31.02	29.85	30.39
Rural	25.66	25.67	25.69	30.60	30.17	30.10
Total	**25.68**	**25.69**	**25.62**	**30.73**	**30.12**	**30.16**
Class Variability Scores						
Inner C.	0.88	0.79	0.83	1.07	1.11	1.10
Suburban	0.70	.69	0.69	1.02	1.07	1.08
Urban	0.81	.81	0.81	1.01	1.13	1.09
Rural	0.65	.71	0.75	0.96	1.08	1.08
Total	**0.72**	**0.73**	**0.76**	**1.00**	**1.09**	**1.08**

Table IV-6 contains the principal main effects (class type) analysis for the 1985-86 results on achievement (SESAT II) and non-cognitive (SCAMIN) results for kindergarten classes. Table IV-6 shows the actual significance levels (for all p<.05) of the analyses, with explanatory notes as appropriate. In summary, smaller classes have significantly higher achievement scores on all four measures. They have significantly higher self-concept scores but not higher academic motivation scores. There are also differences by location, but these disappear when the analysis is controlled for socioeconomic status (SES). That is, SES "explains" differences by location. The analyses and inspection of mean scores (Table IV-4) show that there are no significant differences between regular and regular with a full- time aide classes.

TABLE IV-6

Summary of Tests of Significance for Differences in Kindergarten Class Means and Variability on Achievement and Non-Cognitive Measures by Class Type and School Type: STAR, 1985-86

	Achievement Measures					Non-Cognitive Meas.		
	Math	S&L	W&S	T. Read	All	Mot.	Self-Con.	All
Location								
Class x	.05	.01	.08	.02	.01 [A]	NS	NS	NS
Control for SES	NS	NS	NS	NS	.05 [B]	NS	NS	NS
Variability	NS	NS	.01 [C]	.05	NS	.01 [D]	NS	.05
Class Type								
Class x	.02	.02	.001	.001	.05 [E]	NS	.01 [F]	.05
Control for SES	.02	.01	.001	.001	.05	NS	.01	.05
Variability	NS	NS	NS	NS	NS	NS	.02 [G]	.06
Location X Class Type								
Class x	NS	NS	NS	NS	NS [H]	NS	NS	NS
Control for SES	NS	NS	NS	NS	NS	NS	NS	NS
Variability	NS	NS	NS	NS	NS	NS	NS	NS

S&L=Sounds and Letters; W&S=Words and Sentences; T Read=Total Reading;
NS=Not Significant; S=Small, R=Regular and RA=Regular Class w/Full-time Aide.

[A] For all measures, urban > inner city, esp. reading; inner city has lowest mean, followed by rural, suburban, and urban.

[B] Effects are NS when controlled for SES. SES "explains" school location differences.

[C] Inner city less variable than all others.

[D] Rural and suburban much less variable than urban and inner city.

[E] Small classes significantly better than others on all measures. No difference between (R) and (RA). This is true when controlling for SES.

[F] Small classes higher x Self-Concept than others in all locations. No difference in motivation.

[G] Small classes less variable than (R) and (RA), also higher Self-Concept.

[H] No interaction, type x location. (S) are significantly better to same extent in all locations.

3. Comparison of Class Types Within Schools

Since the regular classes outperformed the small classes in some cases, an analysis was done to compare individual small and regular classes within schools. The analyses employed a "small class advantage score" determined by calculating difference scores for each small class on each measure by subtracting the small class mean from the regular class mean. A **big benefit** of a small class was defined as a difference of two standard errors or more on each test; **some benefit** was a positive gain on each test; **mixed results** was some gain on some tests; **no benefit** was no advantage to the small class on any test. These results are summarized in Table IV-7. Note that on achievement measures small classes benefited 39.4 percent, had mixed results 34.6 percent and no benefit 26 percent. On non-cognitive measures, the respective results were 39.8, 34.7 and 25.4 percents. There are modest overall benefits to small classes in kindergarten. These benefits varied by location with the inner city small classes having the greatest "big benefit" (52 percent) and rural having the least (26.8 percent). Since inner-city schools included the most minority students and rural schools included the fewest, this finding points to a differential effect of small classes favoring minority students.

Results in Table IV-7 suggest that teacher effect is important; good teachers get good results regardless of class size. If true, the issue still remains to be solved: do good teachers get better results in small classes (1:15) than in regular classes (1:25)? Table IV-8 provides a summary of differences between 1) small classes and regular classes and 2) small classes and regular/aide classes on measures shown.

Further analyses were done using only those classes that were termed highly effective. Highly effective small classes were those that had a two standard error advantage over large classes in the same school on every one (of four) achievement and/or both non-cognitive measures. "Ineffective" small classes performed more poorly than regular classes in the same schools on all four achievement and/or both non-cognitive measures respectively.

On four measures (teacher years' experience, teacher highest degree, percent minority and proportion free lunch or SES), there were no patterned (significant) differences between the highly effective and highly ineffective small classes on achievement and non-cognitive measures ($p<.05$).

Classes effective in improving achievement measures are not necessarily effective in achieving positive non-cognitive results ($X2=11.71$, $p<.05$, df2). There are positive ($p<.05$) relationships between each of the achievement measures and self-concept, but not between achievement measures and the non-cognitive measure of achievement motivation.

TABLE IV-7

Benefits to Small Classes on Achievement and Non-Cognitive Measures: STAR Kindergarten (1985-86)

		Big Benefit 2 Standard Error on Ea. Test.	Some Benefit On Each Test	Mixed Results	No Benefit on Any Test
Achievement Tests (n=4)	Classes (n=127)	41 (32.3%)	9 (7.1%)	44(34.6%)	33(26.0%)
	Schools* (n=79)	39 (49.4%)	40 (50.6%)		
Non-Cog. Measures (n=2)	Classes (n=118)	40 (33.9%)	7 (5.9%)	41(34.7%)	30 (25.4%)
	Schools* (n=73)	37 (50.7%)	36 (49.3%)		

* This is just the number of different schools in which these classes are found; not all small classes in these schools may have benefited as shown.

TABLE IV-8

Extent of Small Class Advantage Over Regular (R) and Regular with Aide (RA) Classes: Project STAR, 1985-86, Total Sample

Measures	Small Class Advantage Over...			
	Regular Class		Reg. with Aide	
	Scaled Score	Grade Eq.	Scaled Score	Grade Eq.
Math	6.9	<.1	7.2	<.1
Sounds & Letters	7.3	<.1	5.4	0.0
Words & Sentences	5.5	.1	4.7	.1
Total Reading	6.2	.1	4.9	.1
Self-Concept	.61	.39*	.57	.37*

*Standard deviations

4. Summary

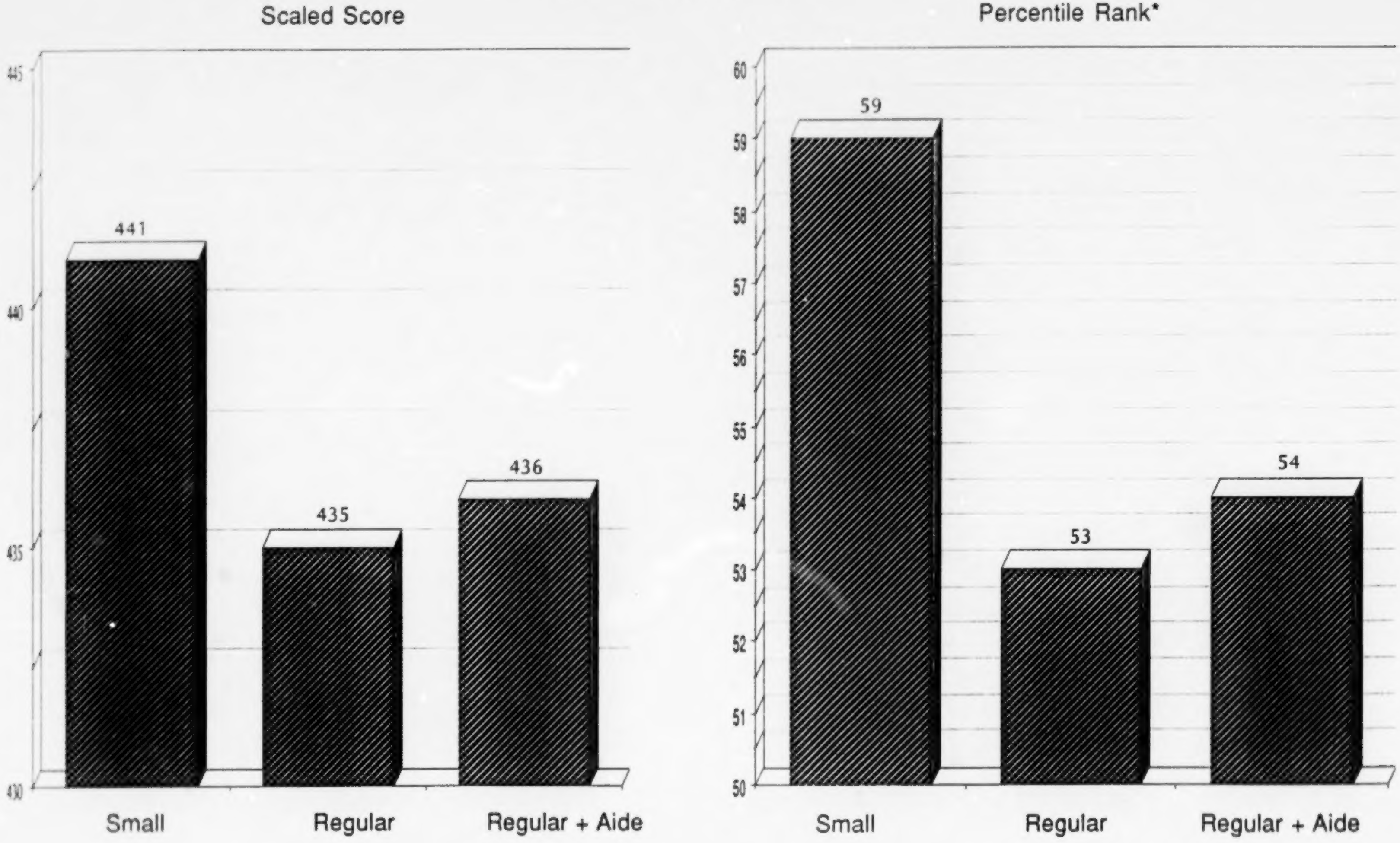
The overall superiority of the performance of students in small classes on the tests used in STAR and the similarity of performance of students in regular and regular/aide classes are shown graphically in Figures IV-1 to IV-6. Figures IV-1 through IV-3 present the scaled scores of kindergarten classes on Total Reading, Total Math, and Word Study Skills from the Stanford Achievement Test (SESAT II) results. Figures IV-4 thru IV-6 show these scaled scores by school location and class type.

STAR's kindergarten results showed definite advantage for small classes in achievement but no significant advantage for the use of a teacher aide. Differences found at the kindergarten level are consistent with the results of some other studies of early primary grades (K-3). A summary of 22 well-designed studies (ERS, 1986) concludes:

> In general the more recent studies that have used a "small" class range of 15-22 have found such class sizes to be related to greater student learning in the early primary grades, (ERS, 1986, p.32.)

The kindergarten results show the consistent finding that small is better, at least in Project STAR.

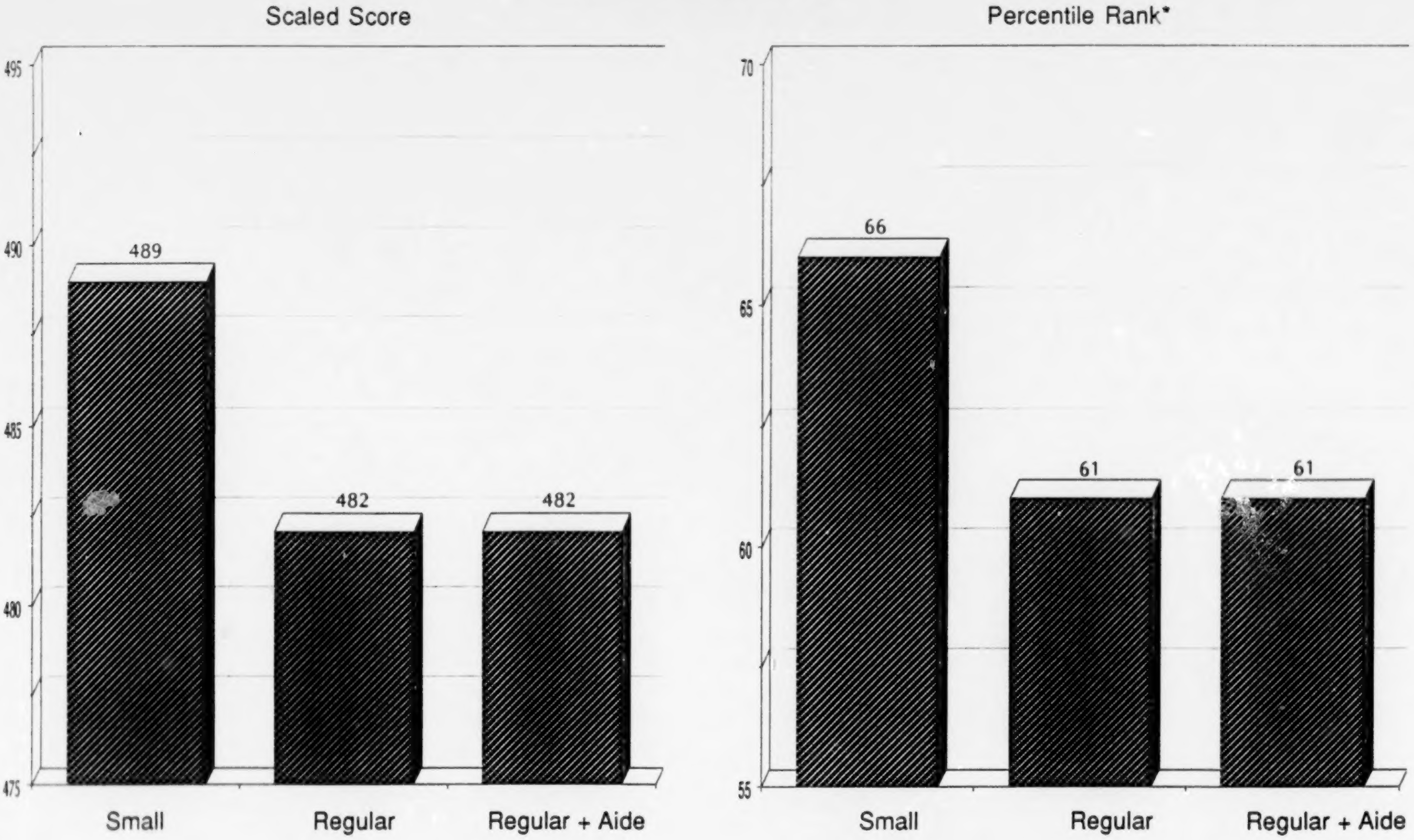
Figure IV-1
Project STAR
Kindergarten Stanford Achievement Test
Total Reading by Class Type



Stanford SESAT II

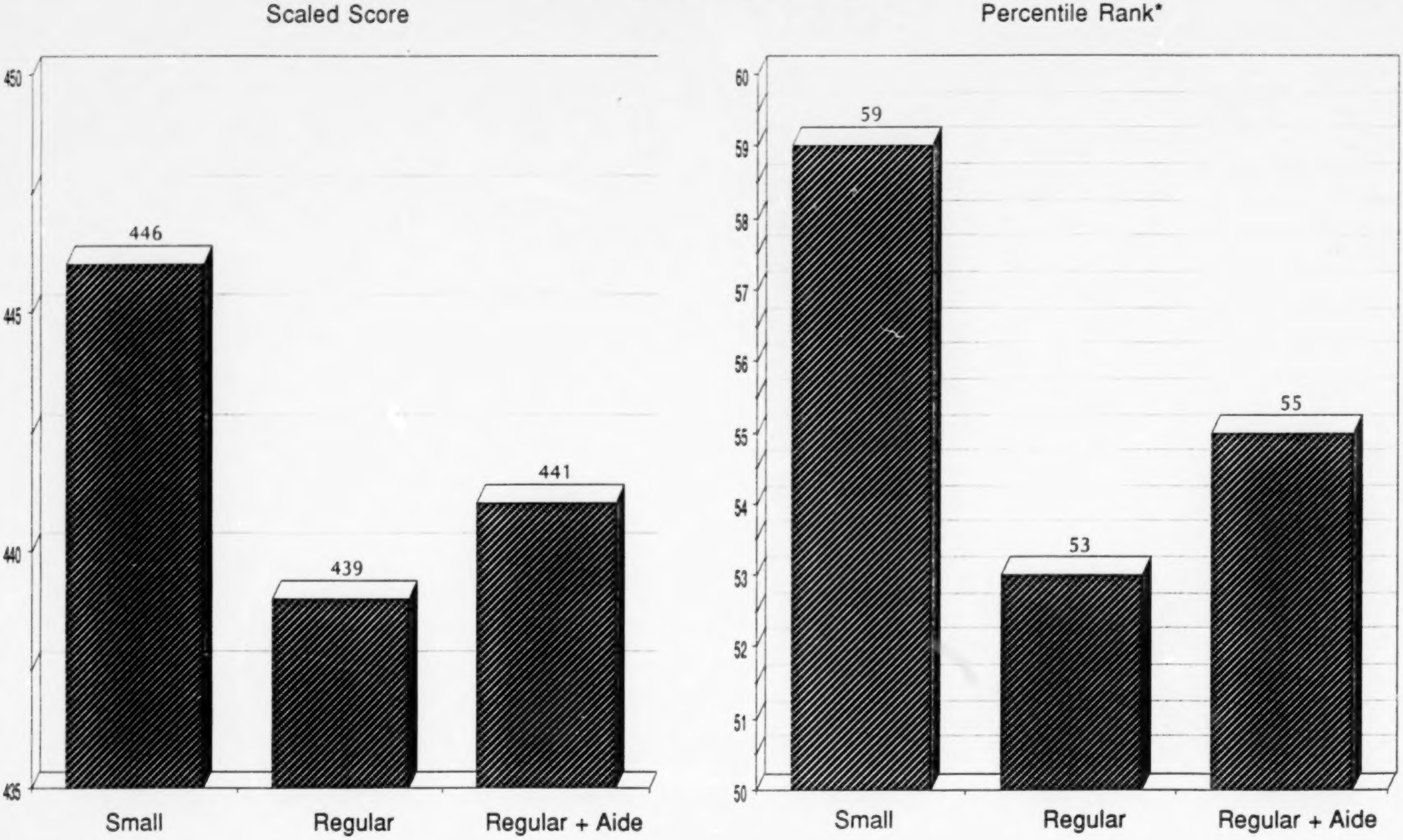
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-2
Project STAR
Kindergarten Stanford Achievement Test
Total Math by Class Type



Stanford SESAT II
*Percentile rank is based on Stanford Multilevel Norms

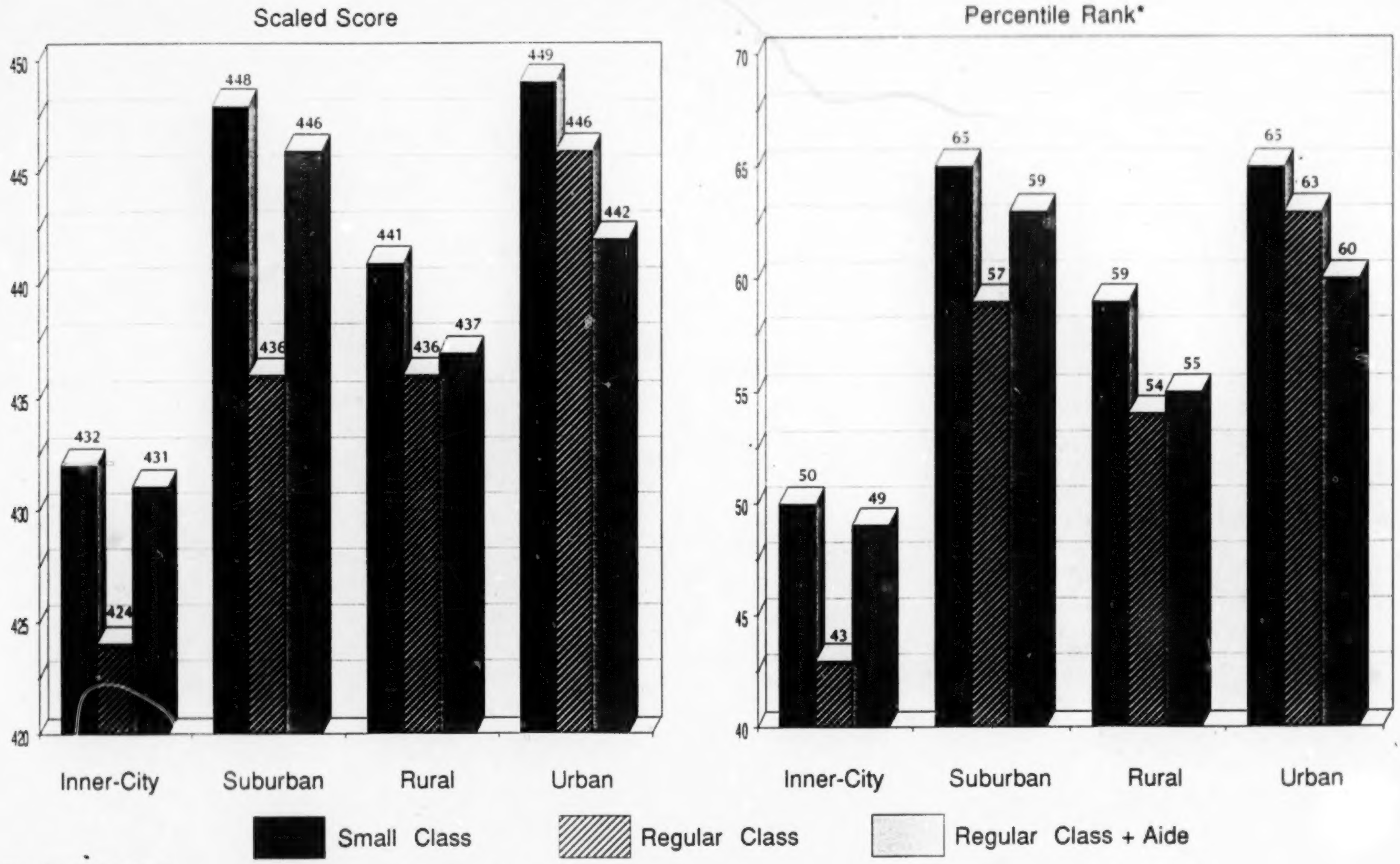
Figure IV-3
Project STAR
Kindergarten Stanford Achievement Test
Word Study Skills by Class Type



Stanford SESAT II

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-4
Project STAR
Kindergarten Stanford Achievement Test
Reading: Class Type by School Type



Stanford SESAT II

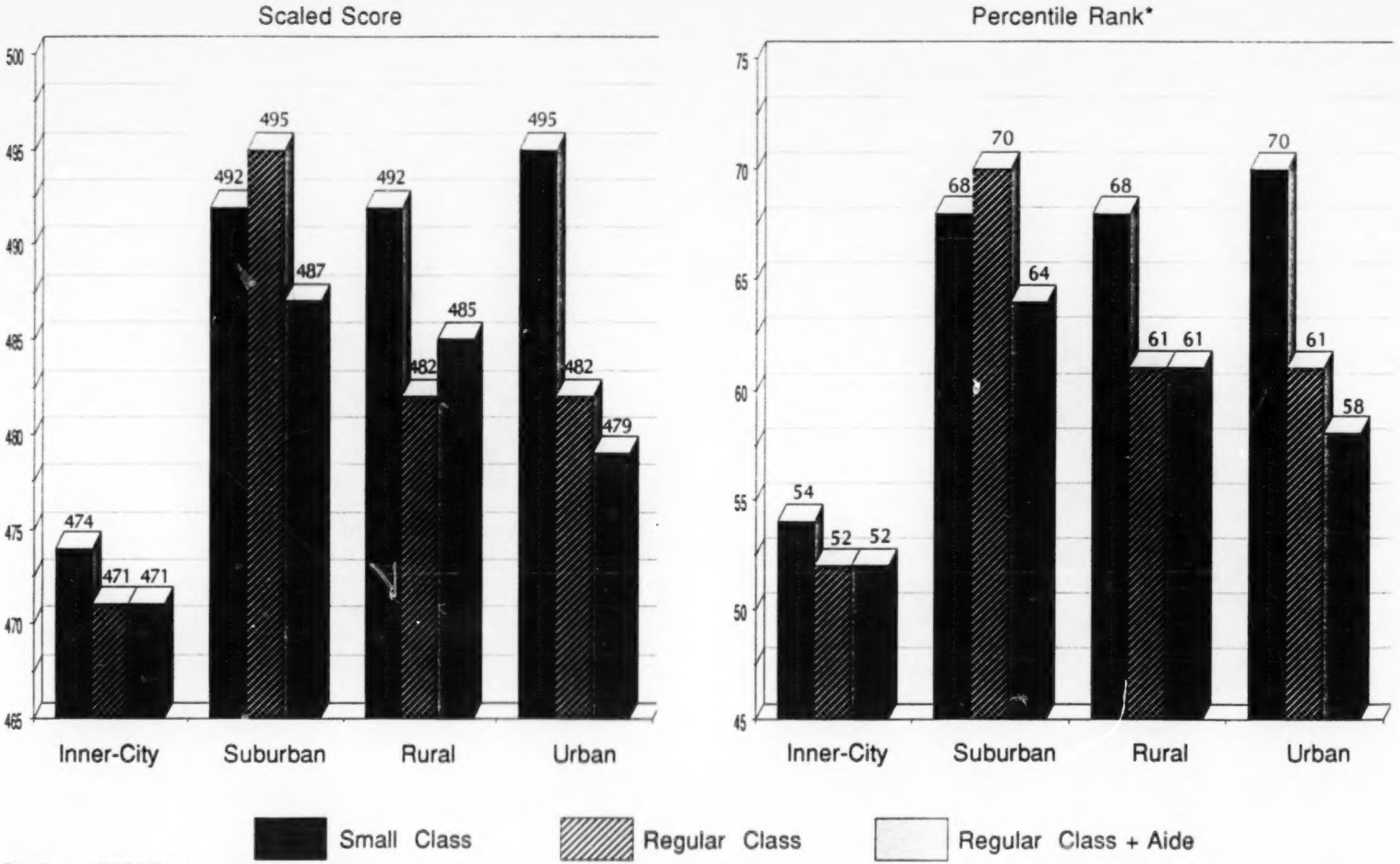
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-5

Project STAR

Kindergarten Stanford Achievement Test

Total Math: Class Type by School Type



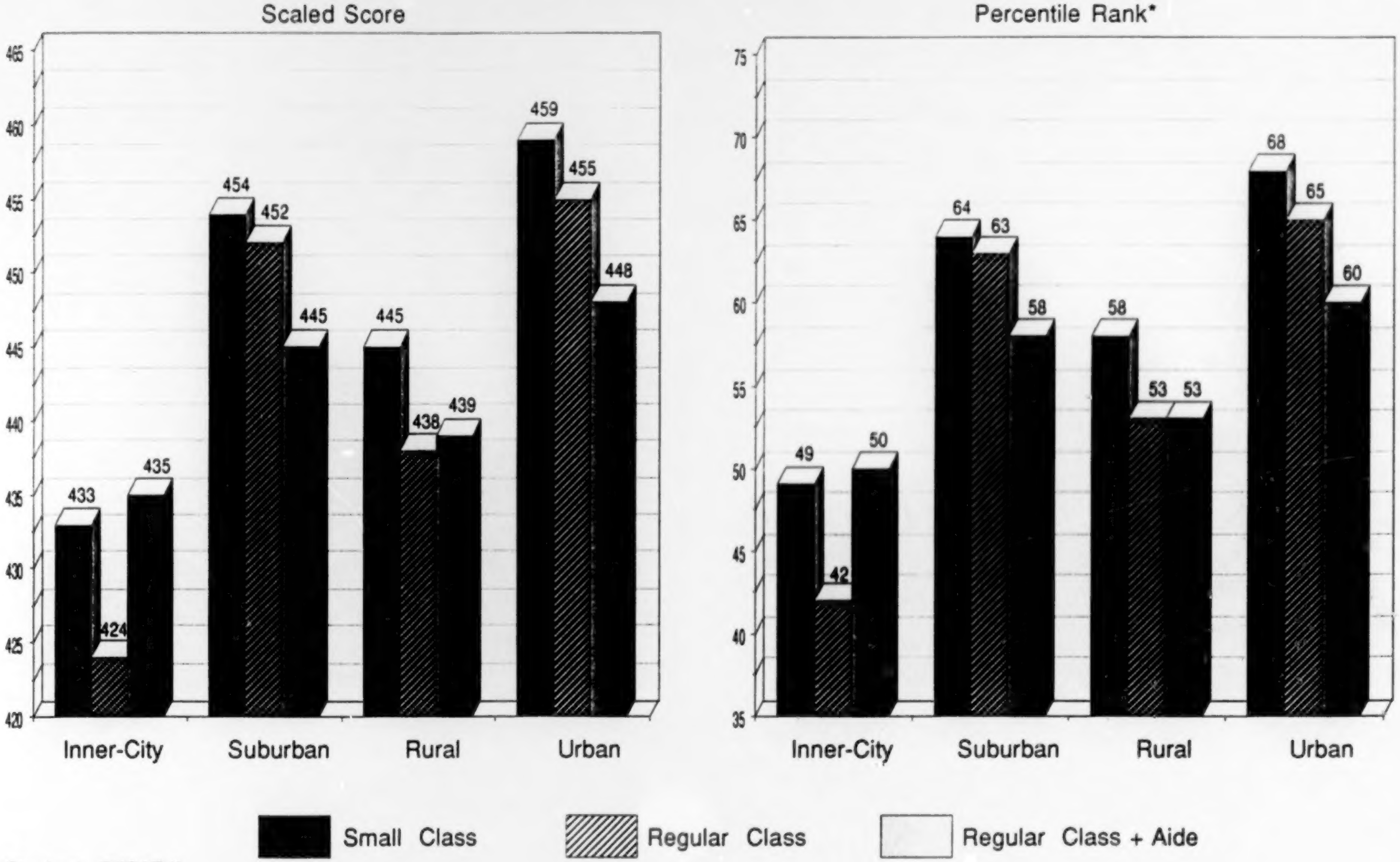
Stanford SESAT II

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-6

Project STAR

Kindergarten Stanford Achievement Test
Word Study Skills: Class Type by School Type



Stanford SESAT II

*Percentile rank is based on Stanford Multilevel Norms

C. First Grade

1. Description of the Data Base

At the beginning of first grade the sample changed as schools were permitted to interchange students in regular and regular with a full-time aide classes. This was due primarily to teacher-identified discipline problems and because some parents complained about their children being in a "regular" class with no opportunity for another condition for four years. Since there were no significant differences between performances of students in regular and regular with aide classes, the exchange between these two class types was allowed. The students in kindergarten small classes remained in first grade small classes and in small classes throughout the study. This first grade interchange resulted in 664 students moving from a regular class to a regular class with a full-time aide while 734 remained in a regular class; 760 moved from regular with aide classes to regular classes, 705 students remained in a regular with aide classes and 1,291 students remained in small classes. In order to achieve sexual and racial balance and to separate incompatible children, 48 students from small kindergarten classes moved to regular with aide classes and 60 moved to regular classes. Because kindergarten is not mandatory, the number of students in the project increased as children entered school for the first time. These were randomly assigned at the beginning of first grade.

Another change from the kindergarten to first grade data base was the school location reclassification of one school from inner city to suburban. In addition, three schools asked to be removed from the project in September 1986 at the end of the kindergarten year: one because of a loss in enrollment; one because of parental dissatisfaction; and one because school personnel elected to ability group across classes. The number of districts, schools, first grade students, and classes by type is reported in Table IV-9.

TABLE IV-9

Number of Districts, Schools, Students and Classes by Type: STAR, 1st Grade (1986 - 87)

	Dist.	Sch.	Pupils	Classes							
				Small		Regular		Regular With Aide		Total	
1986-87 (1)	N	N	N	N	%	N	%	N	%	N	%
Total Project	42	76	6835	124	37	115	33	100	30	339	100
Data Used for Grade 1 Analysis*	42	79	6572	122	37	111	34	98	29	331	100

*This includes students with required test scores who entered 1st grade before November, 1986

2. Achievement Results

The kindergarten results appear in detail in the prior section. Results of the primary year-by-year analyses for students in grades 1, 2 and 3 on the Stanford Achievement Tests (SAT), the State of Tennessee's criterion-referenced Basic Skills First (BSF) tests, and on the SCAMIN are reported in the same format as the kindergarten results shown in Table IV-6 for ease of comparison and reading. At the end of first grade, Project STAR students in small classes were outperforming students in regular and in regular with aide classes by substantial (statistically and educationally significant) margins on standardized tests, and also on the state's Basic Skills First (BSF) test of reading and math. Few consistent differences were found in SCAMIN results. This superior performance by students in small classes was evident in all locations (rural, suburban, urban, and inner city schools), and for students of different races and of both sexes.

As shown in Table IV-10 there were differences ($p<.001$) in class mean scores in the four locations (generally with classes in rural areas having the highest mean scores). Class mean scores by location are shown in Table IV-10. The differences ($p<.001$) by class type, with small classes better than all others on all measures, identifies the strong class-size effect in all school types (inner city, suburban, rural, urban) equally.

The self-concept (SCAMIN) results in grade one generally were not significant based upon class size, but there is a statistically significant result based upon school location. Notes on Table IV-10 explain the specific findings in detail. The pattern shown in Table IV-10 for grade one results is essentially the pattern of results (with minor variation) found for the SCAMIN results in kindergarten and grades two and three.

The primary analysis (class type and location) was also performed on the class results obtained on the state criterion-referenced Basic Skills First (BSF) tests. Those results appear in Table IV-11.

Analysis results of the BSF test scores are essentially the same as results from analyses of data obtained from the SAT. Differences ($p<.001$) were obtained by school location with inner city students performing least well and classes scoring about the same in the other three school types. The strong ($p<.001$) class-size effect showed that the small classes were significantly better (and the teacher aide effect was non-significant) on all measures. These differences were obtained wherever the classes were located.

TABLE IV-10

Project STAR

Grade One Summary of Class-Size Effects Analyses, Using Class Mean Scores on Subtests of the SAT and SCAMIN

Grade 1	SAT Standardized Stanford Achievement Test - Primary I						SCAMIN Self Concept and Motivation		
	Word Study	Reading	Both	Total Reading	Total Listening	Total Math	Motivation	Self Concept	Both
Location	<.001*	<.001	<.001	<.001 [A]	<.001	<.001 [A]	<.01	NS	<.01 [A]
Type	<.001	<.001	<.001	<.001 [B]	<.001	<.001 [D]	NS	NS	NS
Location by Type	NS	NS	NS	NS [C]	<.05 [E]	NS [C]	NS	NS	NS

[A] Means (Rounded) for Location
[B] Small classes significantly better than others on each measure and combined.
[C] Small class significantly better than others (Regular/Aide classes = NS).
[D] Small class advantage is slight, if any, in Rural; 10-14 points elsewhere.
[E] Small class advantage is slight, if any, in Rural; 10-14 points elsewhere.

*Significance Levels (p<.05) are tabled

School Type	Standardized Stanford Achievement Test Word Study	Reading	Total Reading	Total Listening	Total Math	SCAMIN Self Concept & Motivation
Inner-City	497	486	490	549	510	49.7
Suburban	535	520	526	572	534	49.8
Rural	540	525	532	573	539	50.2
Urban	538	522	529	573	535	50.5

TABLE IV-11

Project STAR

Grade One Summary of Class-Size Effects Analyses, Using Class Percent Passing (Log-odds Index) on the BSF Tests

	Grade 1, Criterion Referenced Basic Skills First Tests					
	Reading Raw Score	Reading % Passing	Both	Math Raw Score	Math % Passing	Both
Location	<.001*	<.05	<.001	<.001	<.001	<.001 [A]
Type	<.001	<.001	<.001 [B]	<.001	<.001	<.001 [B]
Location by Type	NS	NS	NS [C]	<.05	NS	NS [D]

[A] Average percent passing (rounded) for location. Average percent passing (rounded) for class type.
[B] Small classes significantly better than others on each measure (Regular/ Aide classes NS).
[C] Small class advantage is the same for all locations.
[D] Small class advantage slight, if any for rural; 1.4 - 2.2 in other locations.

*Significance Levels (p<.05) are tabled

School Type	Reading % Passing	Math % Passing
Inner-City	52	71
Rural	66	86
Suburban	66	85
Urban	66	83

Class Type	Reading % Passing	Math % Passing
Small	69	86
Regular	58	79
Regular / Aide	61	81

3. Summary

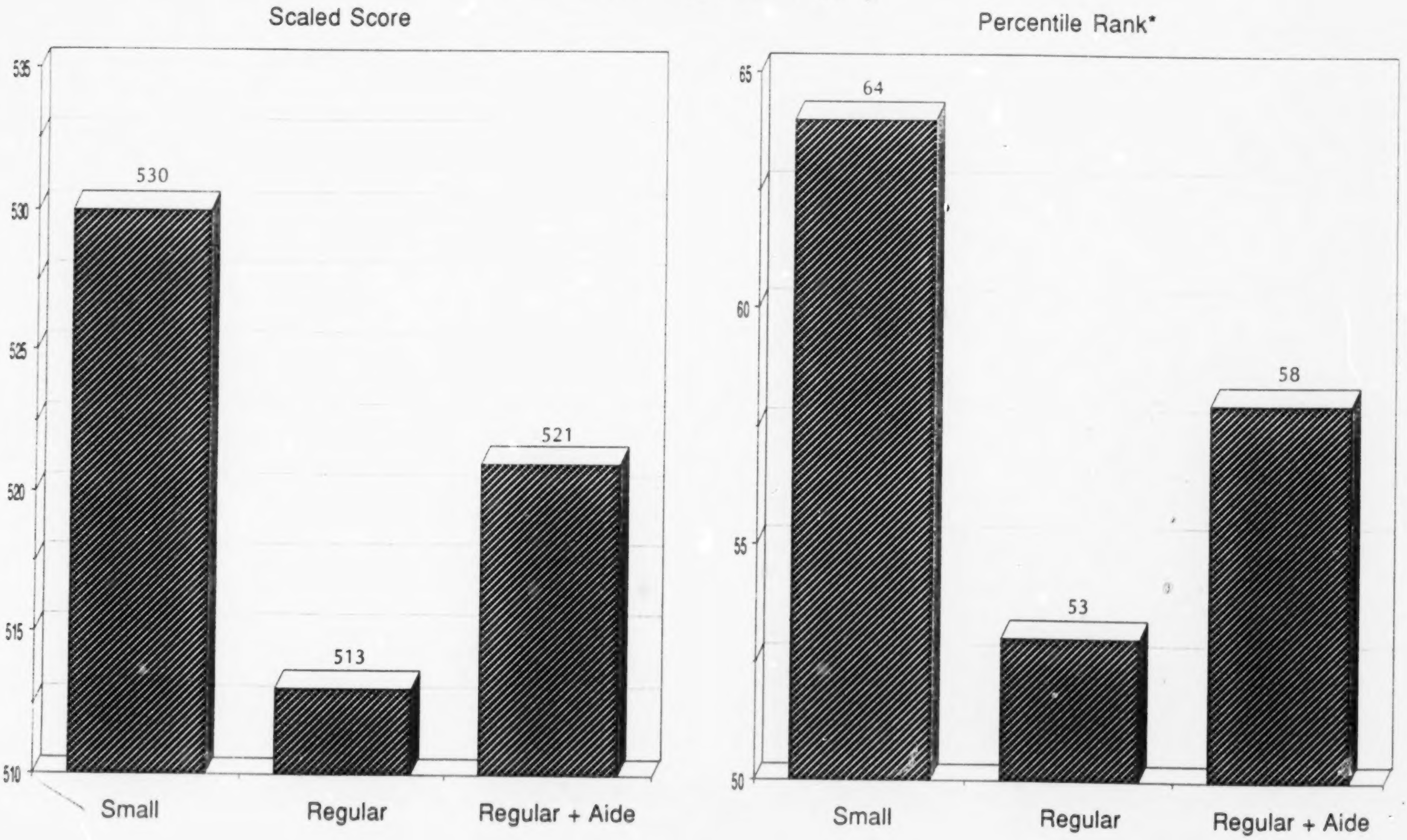
In grade one, students in small classes performed better on all tests used in STAR than did students in regular classes and regular classes with a full-time aide. The graphic representations in Figures IV-7 through IV-9 show the SAT scaled scores in each of the three class types in first grade. Figures IV-10 through IV-12 contain first grade scaled scores by school location and class type. The small class advantage and the regular/aide advantage are consistent across all four school types (Figures IV-10 to IV-12). A comparison of cross-sectional SAT reading and math results for kindergarten (SESAT II) and first grade (Primary I) is shown in Figures IV-13 and IV-14. Figures IV-15 and IV-16 show the mean percent of the BSF skills mastered by STAR first grade students in each of the three class types.

There is a strong, positive class-size effect in grade one, and a positive but not particularly strong effect for regular classes with a full-time teacher aide. (Magnitude of differences among class types for grades 1, 2, and 3 are shown in Section E, p. 100).

Figure IV-7

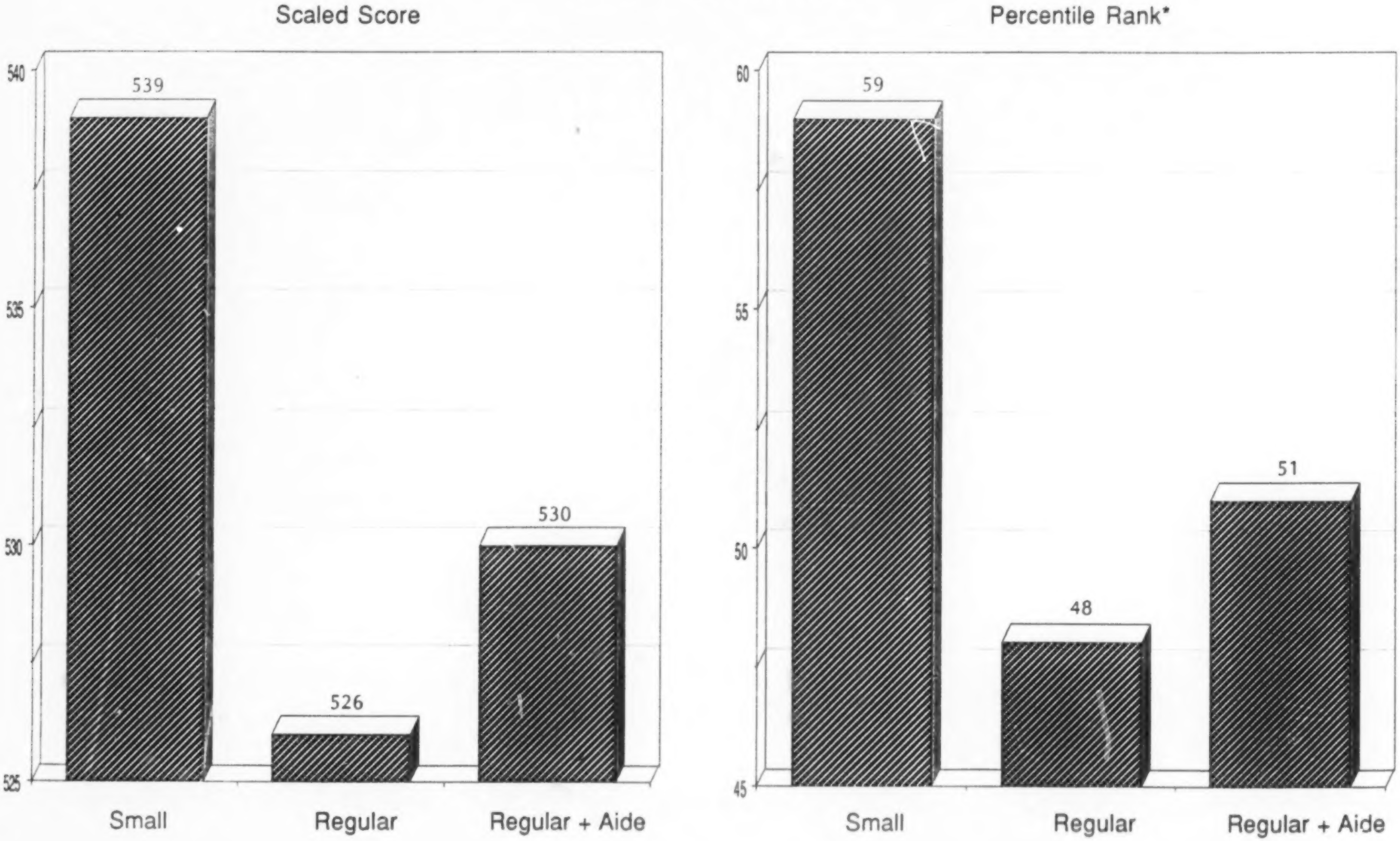
Project STAR

First Grade Stanford Achievement Test
Total Reading by Class Type



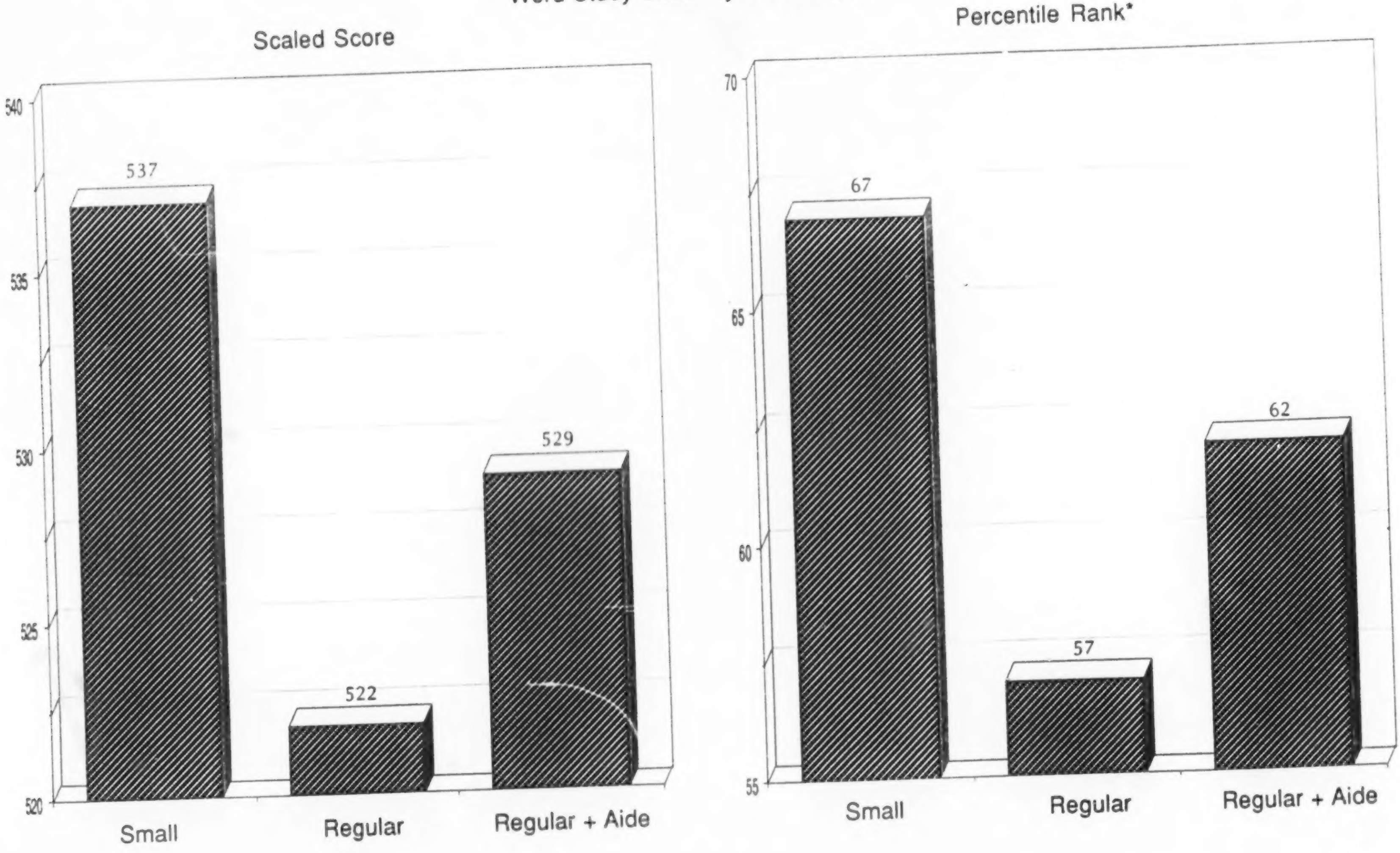
Stanford Primary I
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-8
Project STAR
First Grade Stanford Achievement Test
Total Math by Class Type



Stanford Primary I
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-9
Project STAR
First Grade Stanford Achievement Test
Word Study Skills by Class Type



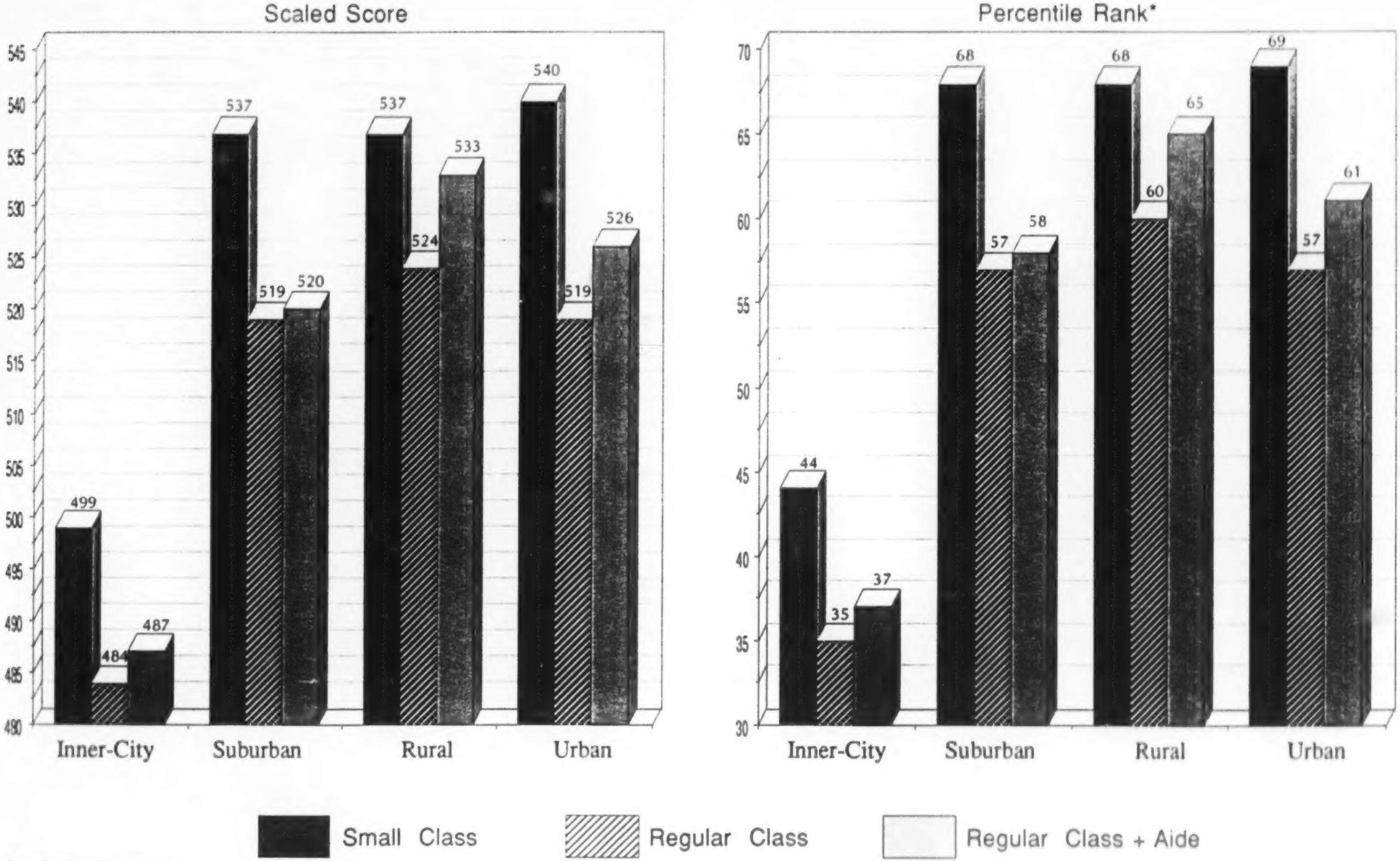
Stanford Primary I
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-10

Project STAR

First Grade Stanford Achievement Test

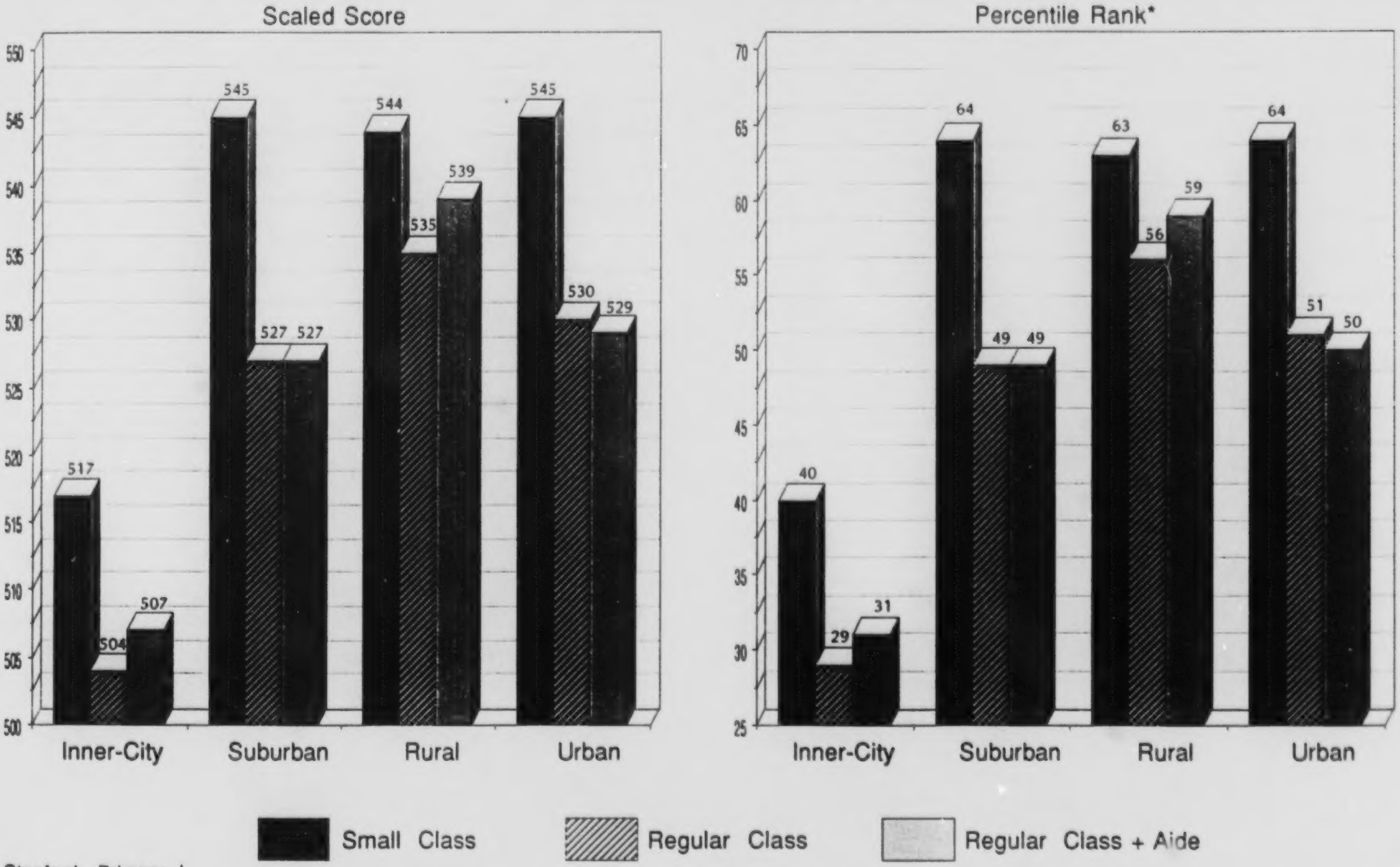
Total Reading: Class Type by School Type



Stanford Primary I

*Percentile rank is based on Stanford Multilevel Norms

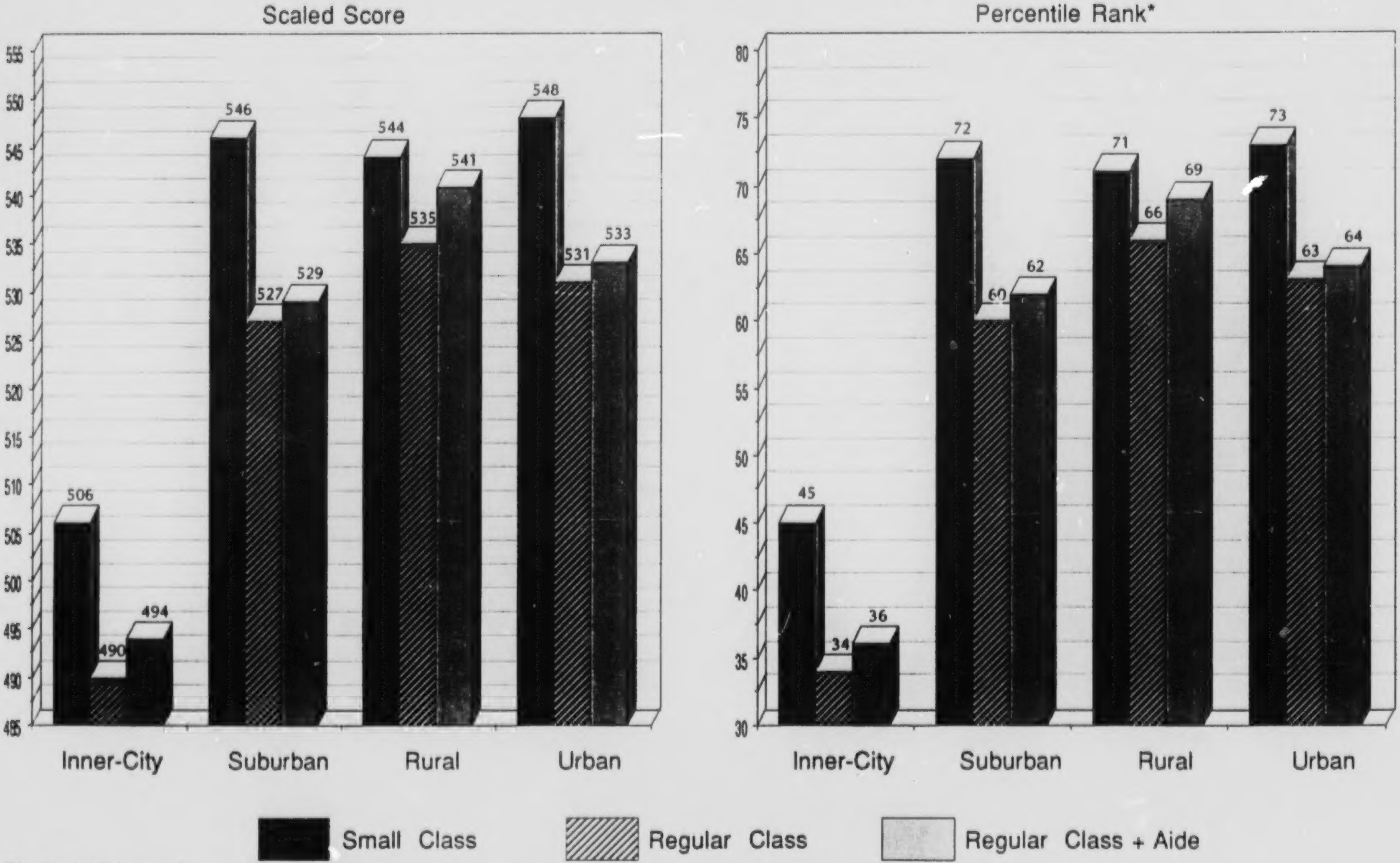
Figure IV-11
Project STAR
First Grade Stanford Achievement Test
Math: Class Type by School Type



Stanford Primary I

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-12
Project STAR
First Grade Stanford Achievement Test
Word Study Skills: Class Type by School Type



Stanford Primary I

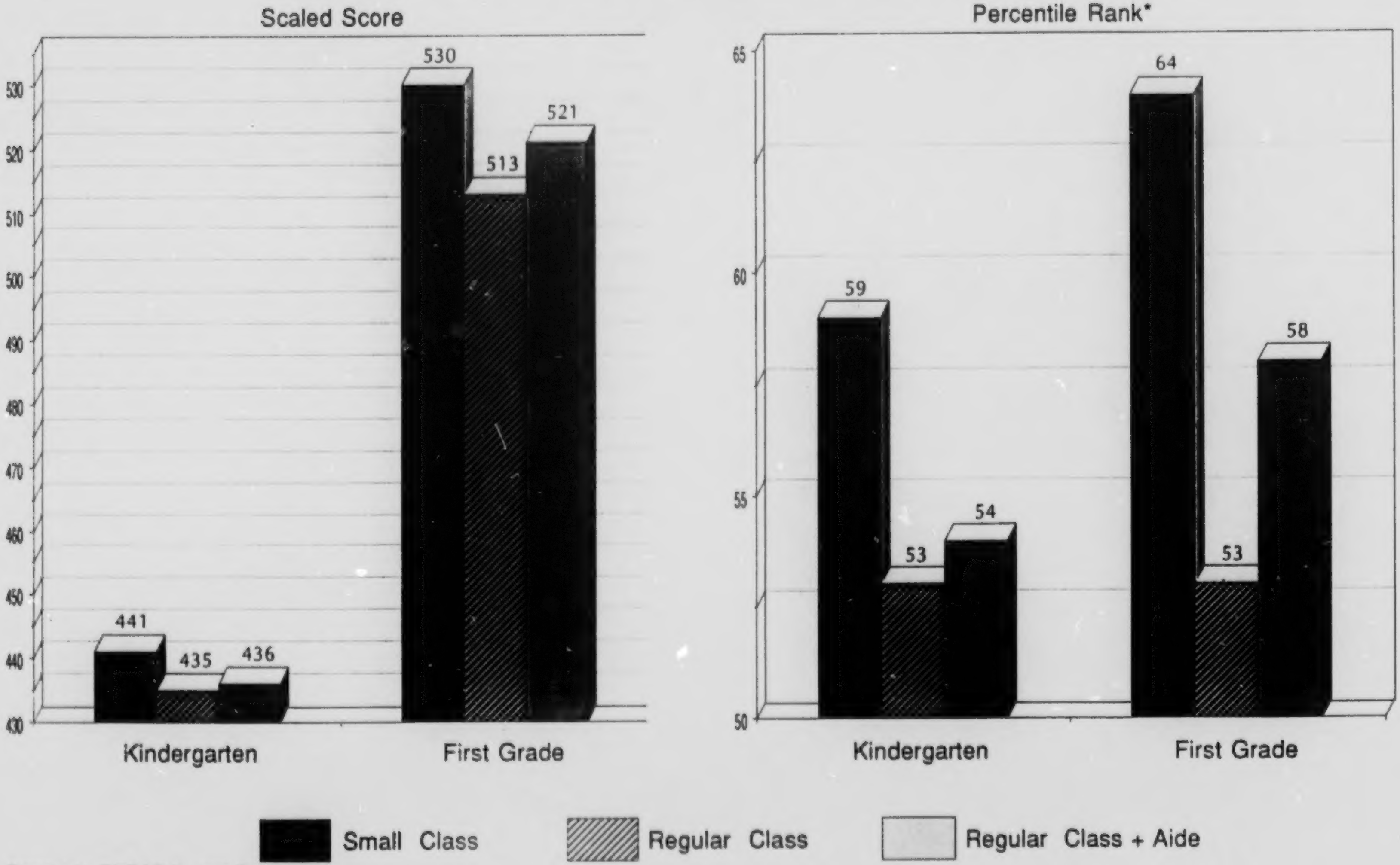
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-13

Project STAR

Stanford Achievement Test

Total Reading: Class Type by Grade



Stanford SESAT II and Primary I

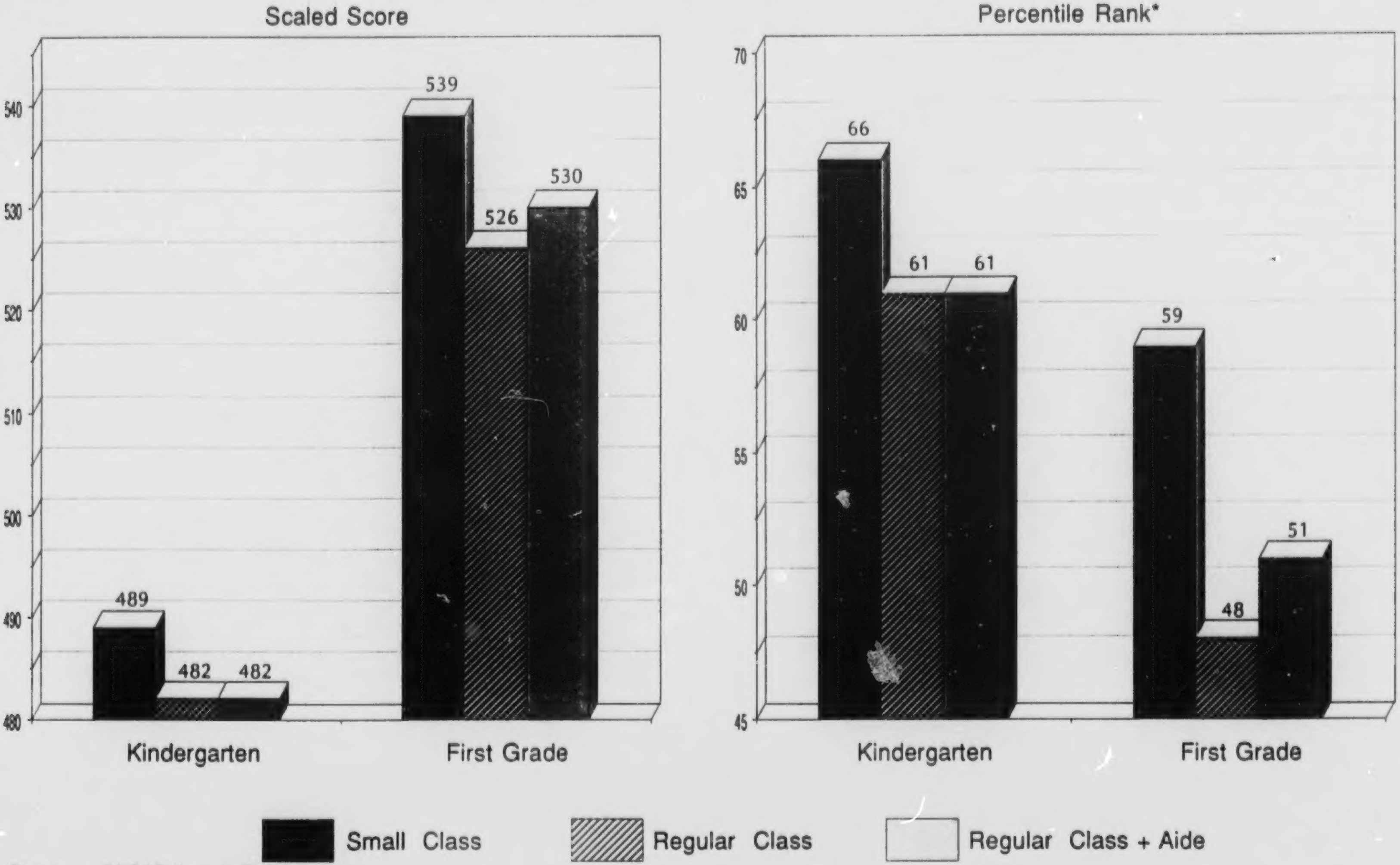
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-14

Project STAR

Stanford Achievement Test

Total Math: Class Type by Grade



Stanford SESAT II and Primary I

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-15

Project STAR

First Grade Basic Skills First Test

Reading Skills Mastered by Class Type

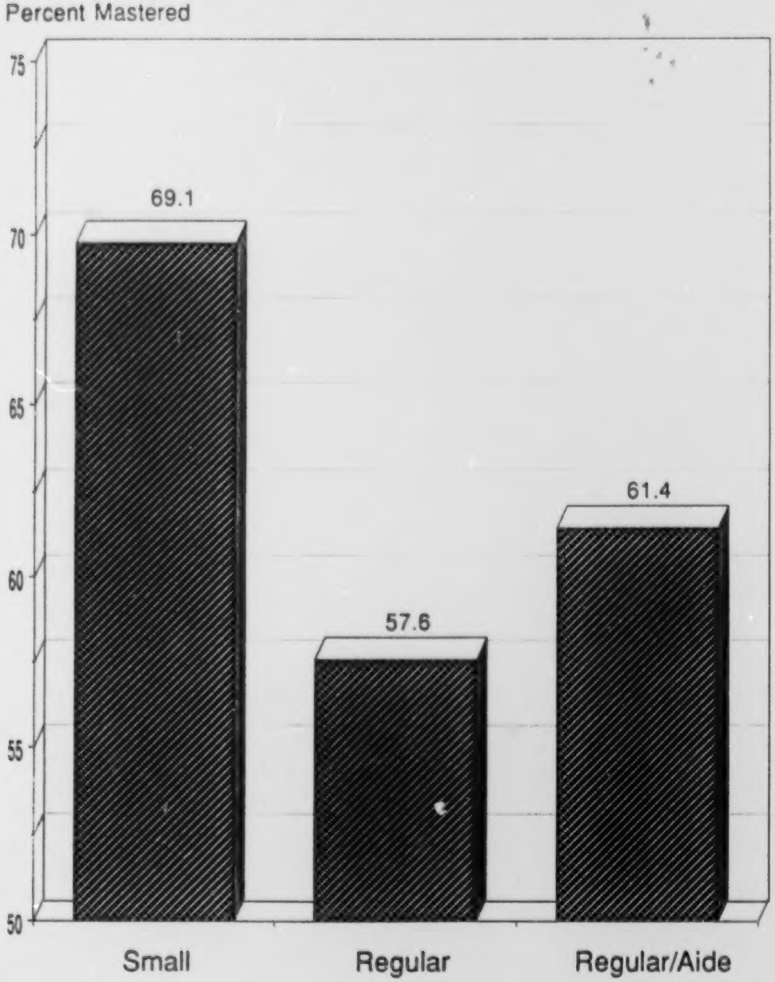
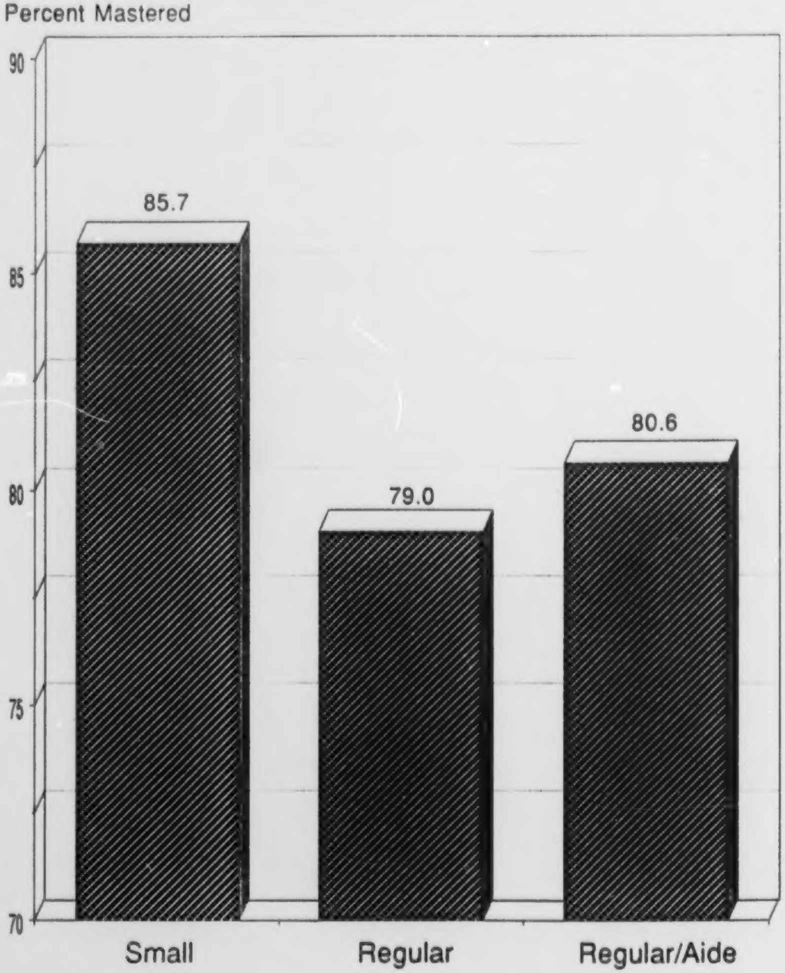


Figure IV-16

Project STAR

First Grade Basic Skills First Test

Mathematics Skills Mastered by Class Type



D. Second Grade

1. Description of the Data Base

The data base for the primary analyses changed again in the second grade. One elementary school withdrew after first grade because personnel no longer wished to conform to STAR guidelines. This reduced the number of districts to 41 and the number of schools to 75. Due to new students entering project schools, the number of students increased to 6,846. However, the number of students included in the test analysis dropped from 6,572 to 5,328 (see Table IV-12). In grade two a subset of STAR schools participated in a training program. Dr. Finn conducted analyses to compare the class scores of teachers (N=67) who received Project STAR training and those who did not. The findings indicated that training as conducted in this component made no difference at this grade level. The results reported for second grade are derived from analyses based on the untrained teachers' (N=273) classes only. The districts were reduced from 41 to 35, and schools dropped from 75 to 62. This maintained consistency for the longitudinal analyses and meant that cross-sectional analyses were built on the same condition (no training).

TABLE IV-12

Number of Districts, Schools, Students and Classes by Type: STAR, 2nd Grade (1986 - 87)

	Dist.	Sch.	Pupils	Classes							
				Small		Regular		Regular With Aide		Total	
1987-88 (2)	N	N	N	N	%	N	%	N	%	N	%
Total Project	41	75	6846	133	39	100	29	107	32	340	100
Data Used for Grade 2 Analysis*	35	62	5328	109	40	79	29	85	31	273	100

*This includes students with required test scores who entered 2nd grade before November, 1987. It excludes classes of the teachers who received Project STAR training.

2. Achievement Results

Students in small classes continued to outperform students in regular and regular with a full-time aide classes on all tests in the second grade. Although students in regular classes with a full-time aide outperformed students in regular classes, the differences were not significant. There were significant advantages for students in small classes on SAT in reading, math, listening, and word study, and a similar advantage on the Tennessee BSF tests in reading and math.

TABLE IV-13

Project STAR

Grade Two Summary of Class-Size Effects Analyses, Using Class Mean Scores on Subtests of the SAT and SCAMIN

Grade 2	SAT Standardized Stanford Achievement Test - Primary II						SCAMIN Self Concept and Motivation		
	Word Study	Reading	Both	Total Reading	Total Listening	Total Math	Motivation	Self Concept	Both
Location	<.001*	<.001	<.001	<.001	<.001	<.001 [A]	NS	<.001 [A]	<.01
Type	<.001	<.001	<.001	<.001	<.001	<.001 [B]	NS	NS	NS
Location by Type	NS	NS	NS	NS	NS	NS	NS	NS	NS [C]

[A] Means (Rounded) for Location

[B] Small classes significantly better than others on each measure and combined. Regular/Aide contrast always NS.

[C] Small class advantages are consistent for all locations. Regular/Aide contrast always NS.

*Significance Levels (p<.05) are tabled

School Type	Standardized Stanford Achievement Test Word Study	Reading	Total Reading	Total Listening	Total Math	SCAMIN Self Concept
Inner-City	559	559	559	575	561	48.9
Suburban	587	585	585	597	579	48.1
Rural	602	593	596	604	592	48.0
Urban	595	590	592	601	582	48.2

TABLE IV-14

Project STAR

Grade Two Summary of Class-Size Effects Analyses, Using Class Percent Passing (Log-odds Index) on the BSF Tests

Grade 2, Criterion Referenced Basic Skills First Tests			
	Reading % Passing	Math % Passing	Both
Location	<.001*	<.01	<.001[A]
Type	<.05	<.05	<.05 [B]
Location by Type	NS	NS	NS

[A] Average percent passing (rounded) for location. Average percent passing (rounded) for class type.

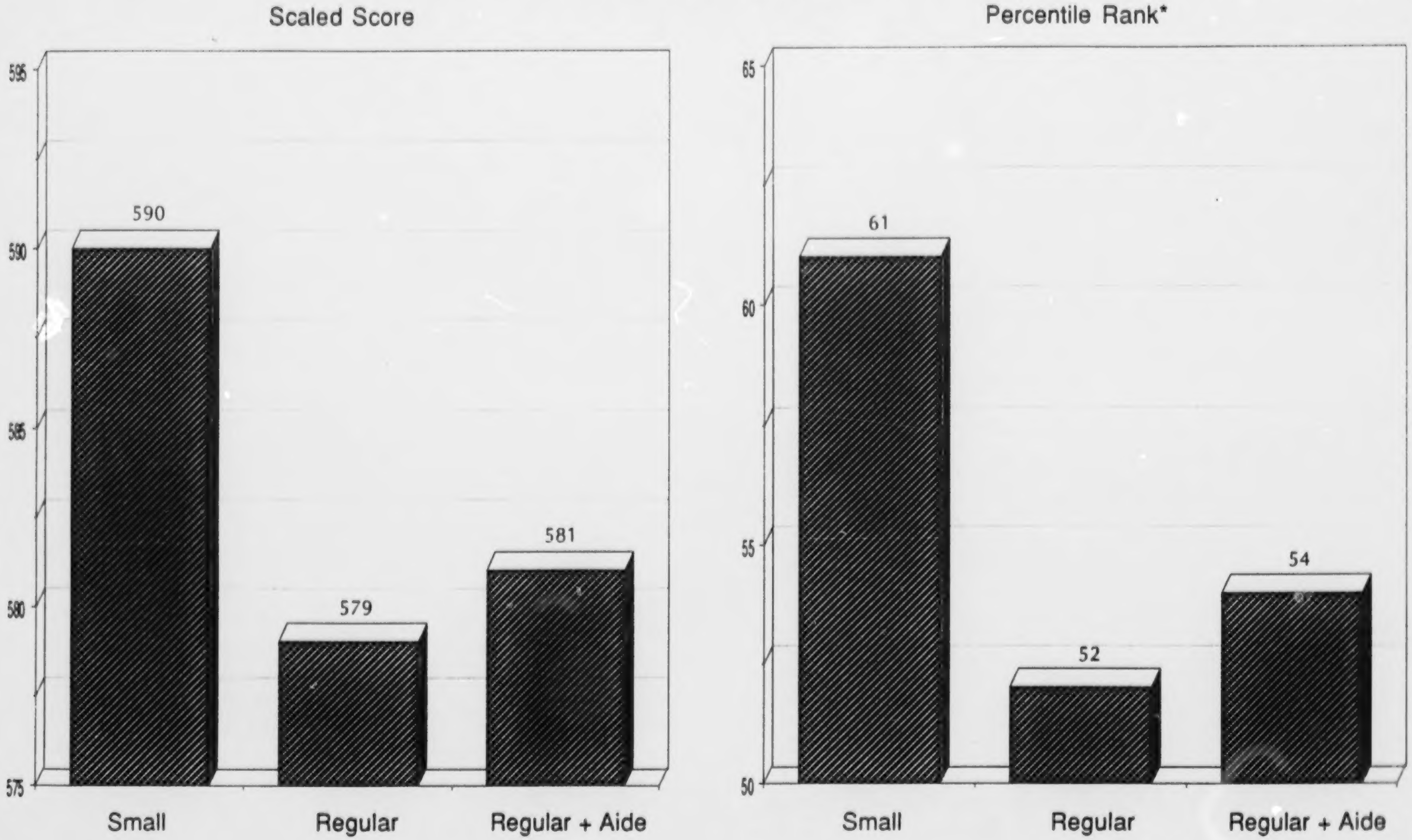
[B] Small class contrast significant at p<.01 for each measure and both together; Regular / Aide class contrast was NS.

*Significance Levels (p<.05) are tabled

School Type	Reading % Passing	Math % Passing
Inner-City	48	72
Rural	75	87
Suburban	71	80
Urban	67	79

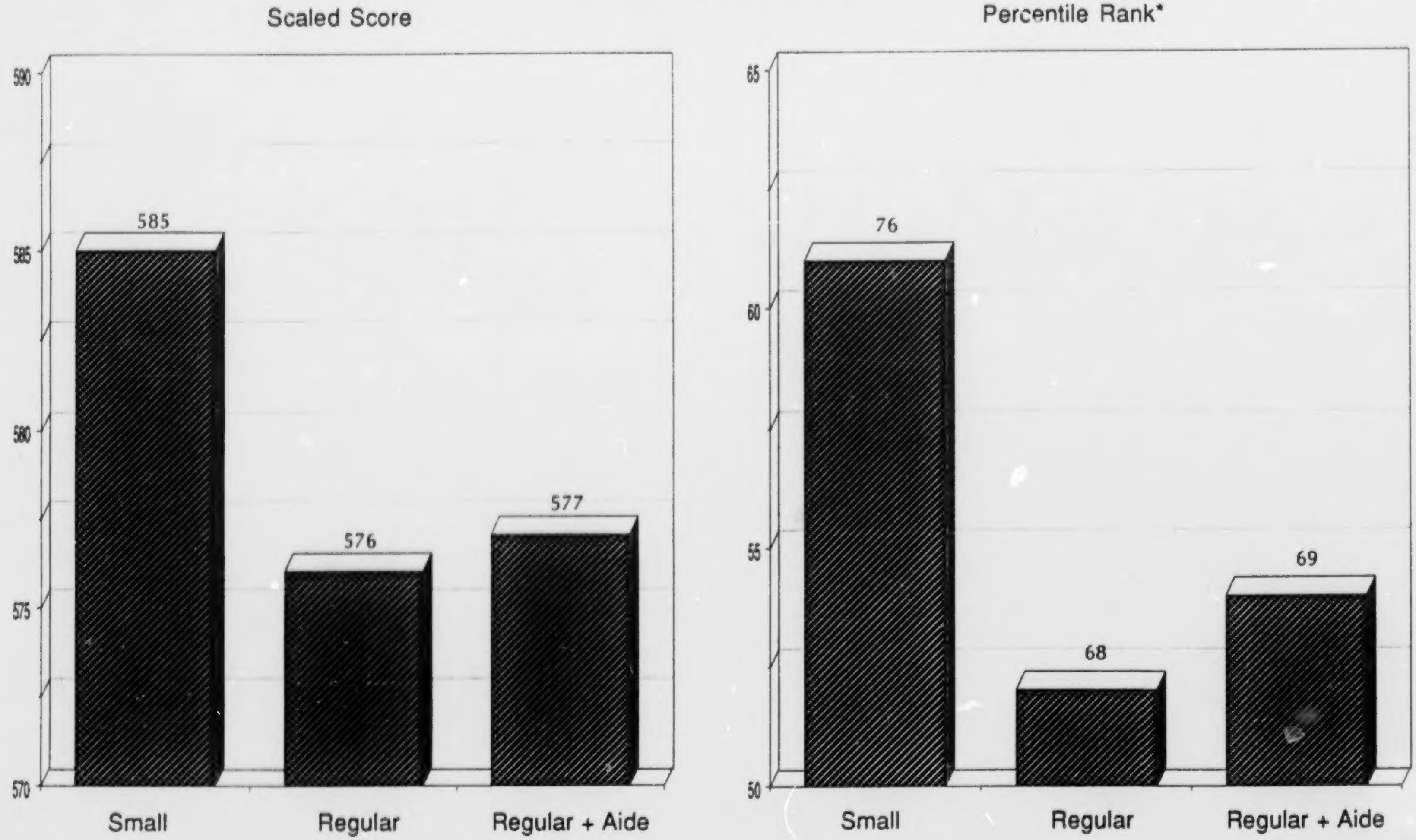
Class Type	Reading % Passing	Math % Passing
Small	71	84
Regular	63	77
Regular / Aide	64	80

Figure IV-17
Project STAR
Second Grade Stanford Achievement Test
Total Reading by Class Type



Stanford Primary II
*Percentile rank is based on Stanford Multilevel Norms

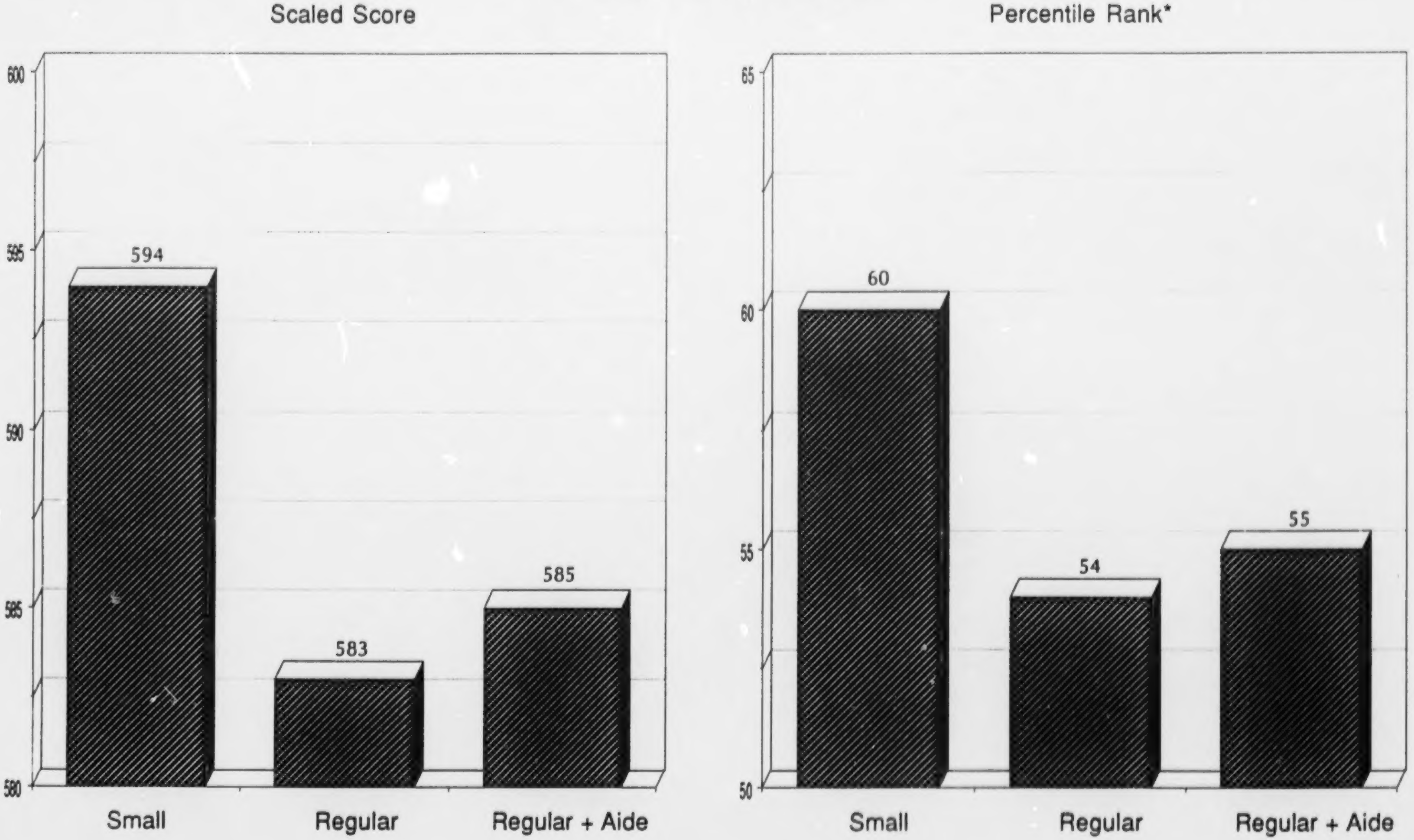
Figure IV-18
Project STAR
Second Grade Stanford Achievement Test
Total Math by Class Type



Stanford Primary II

*Percentile rank is based on Stanford Multilevel Norms

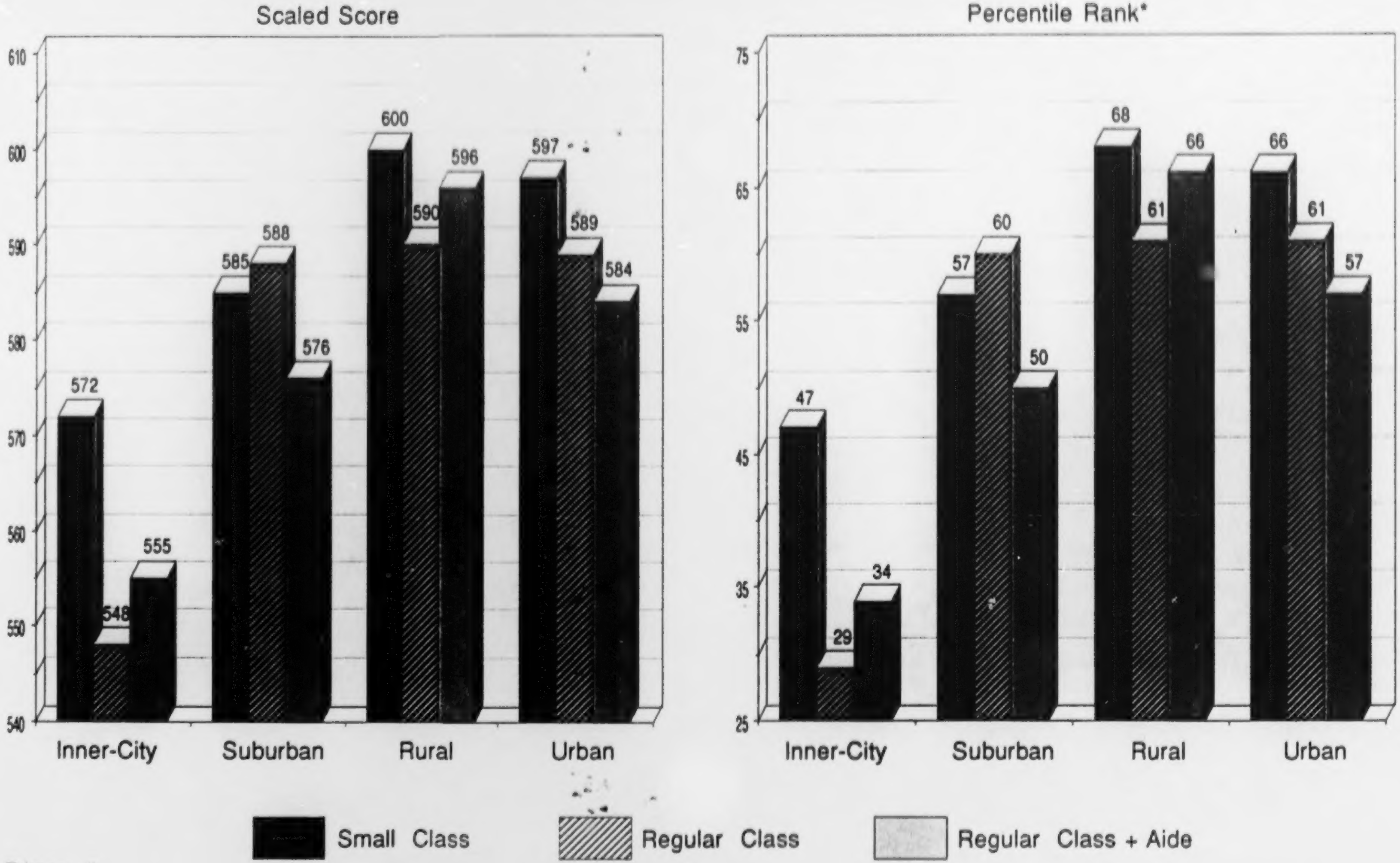
Figure IV-19
Project STAR
Second Grade Stanford Achievement Test
Word Study Skills by Class Type



Stanford Primary II

*Percentile rank is based on Stanford Multilevel Norms

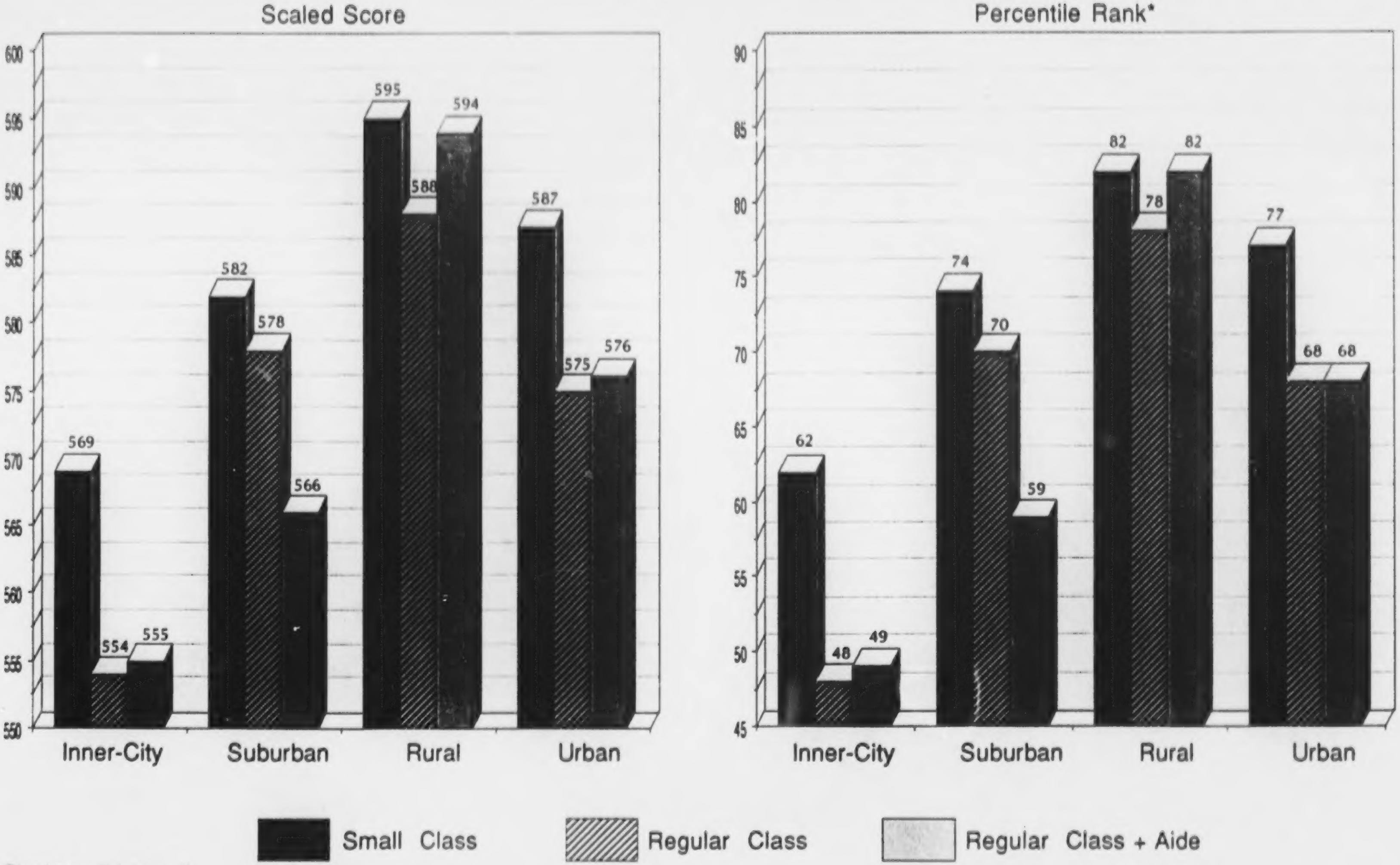
Figure IV-20
Project STAR
Second Grade Stanford Achievement Test
Total Reading: Class Type by School Type



Primary II

*Percentile rank is based on Stanford Multilevel Norms

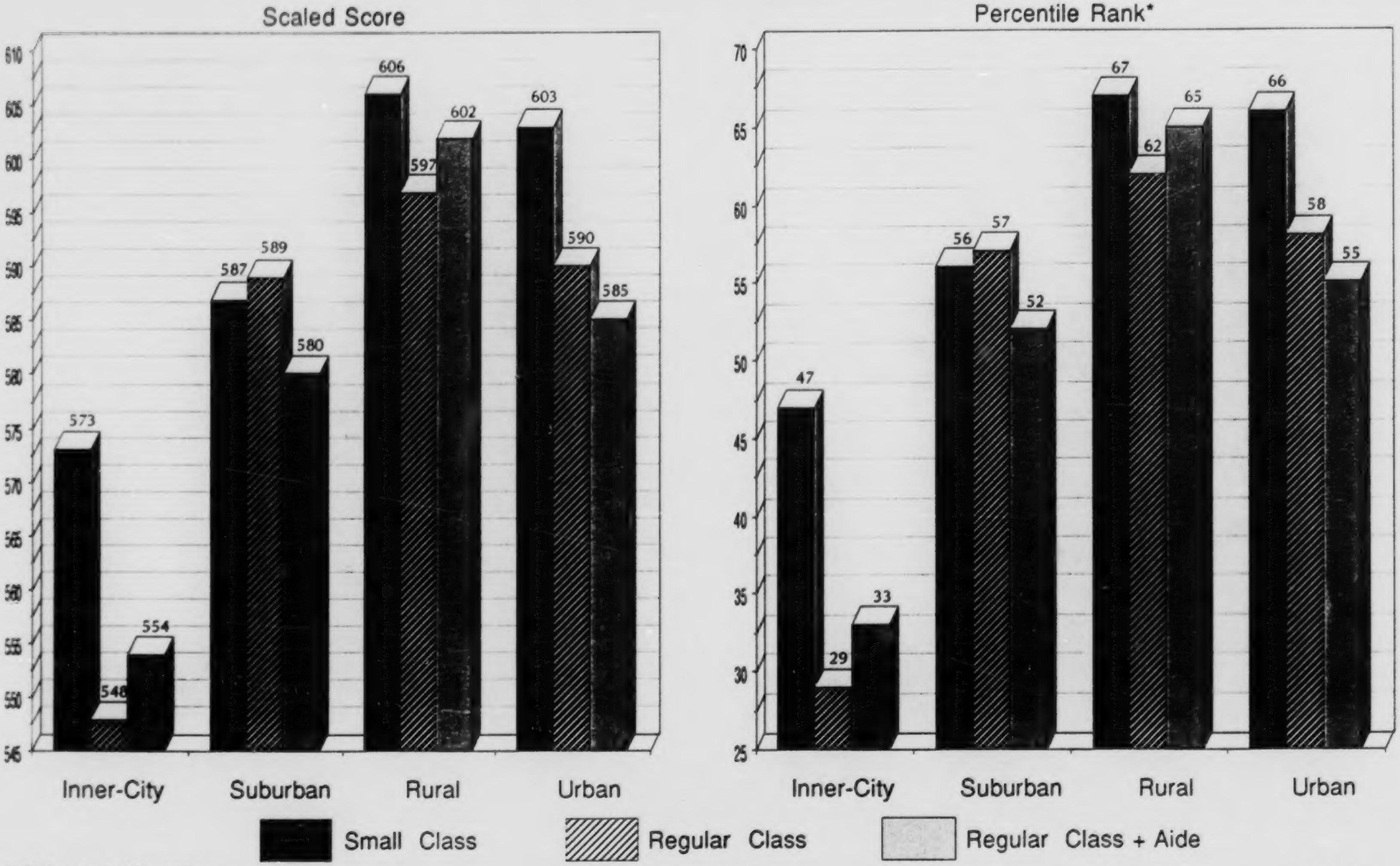
Figure IV-21
Project STAR
Second Grade Stanford Achievement Test
Total Math: Class Type by School Type



Stanford Primary II

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-22
Project STAR
Second Grade Stanford Achievement Test
Word Study Skills: Class Type by School Type



Utilizing Individual Norms

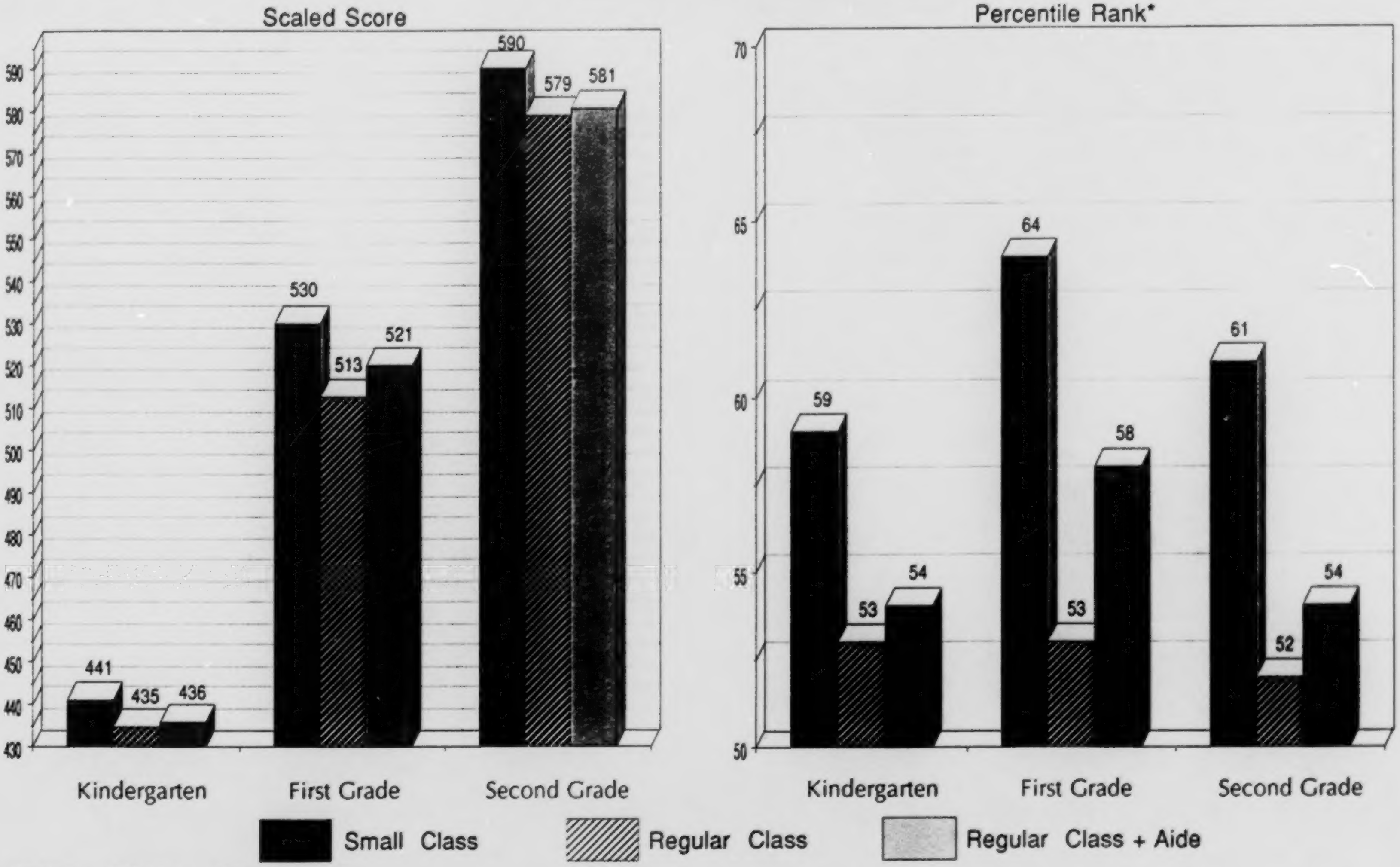
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-23

Project STAR

Stanford Achievement Test

Total Reading: Class Type by Grade



Stanford SESAT II, Primary I and II

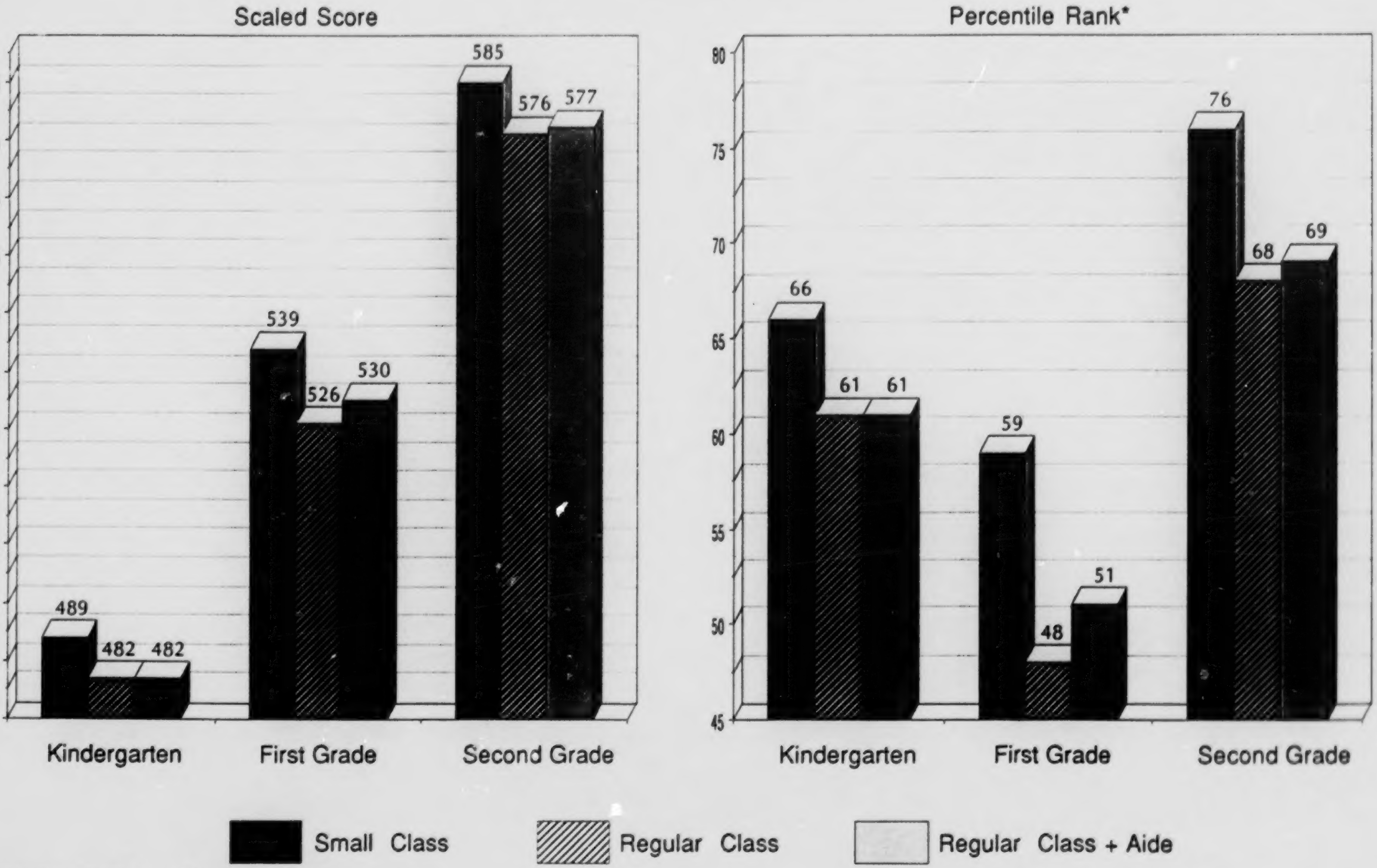
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-24

Project STAR

Stanford Achievement Test

Total Math: Class Type by Grade



Stanford SESAT II, Primary I and II

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-25
Project STAR
Second Grade Basic Skills First Test
Reading Skills Mastered by Class Type

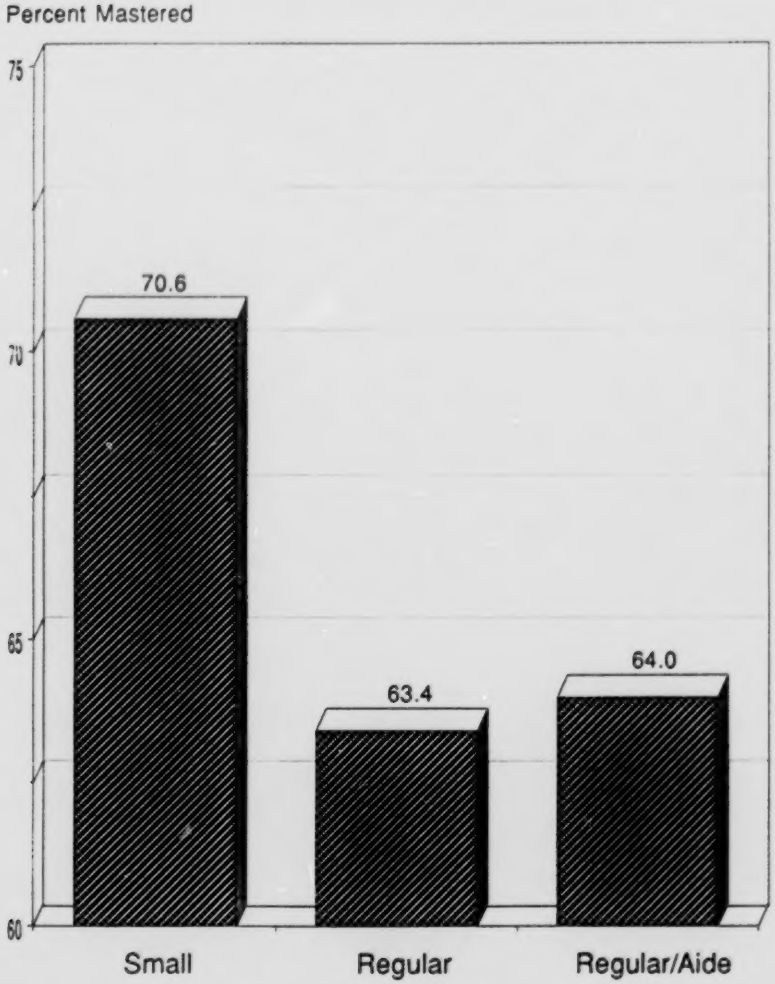
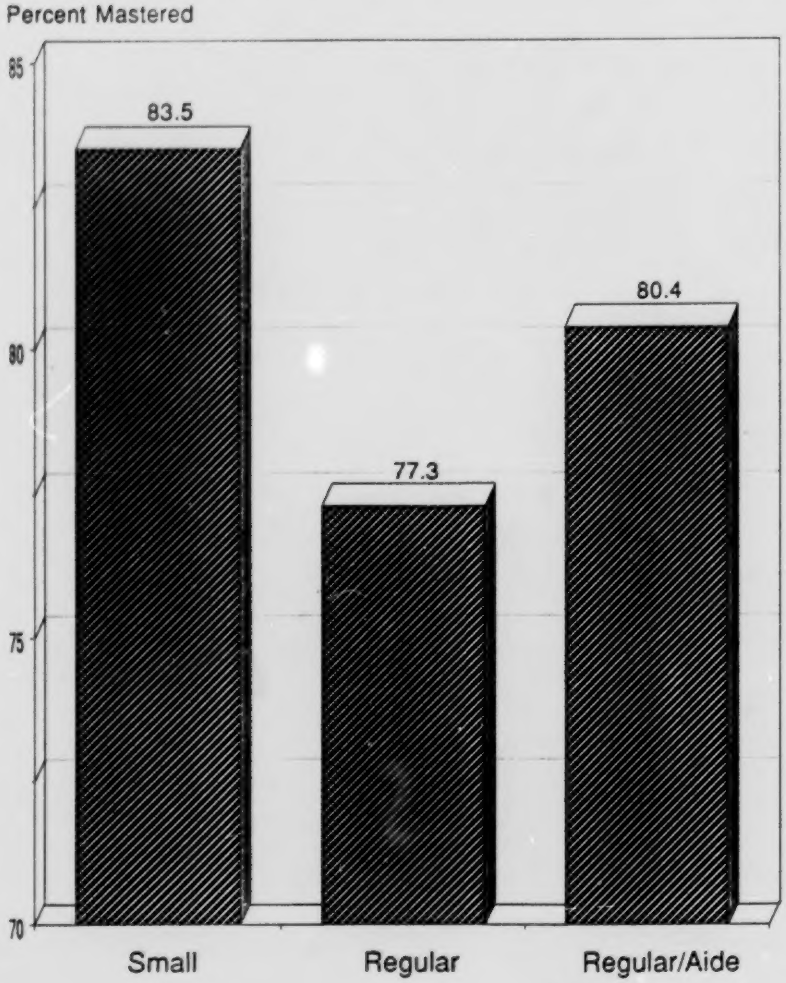


Figure IV-26
Project STAR
Second Grade Basic Skills First Test
Mathematics Skills Mastered by Class Type



E. Third Grade

1. Description of the Data Base

The number of students in the third grade sample slightly decreased from 6,846 in second grade to 6,804. In an effort to keep the sample for analysis as consistent as possible from year to year for all project years, only the class scores of the untrained teachers were used in the primary analysis. The number of students in the primary analysis dropped to 4,744. This also lowered the number of districts to 35. The number of schools used for analysis dropped from 62 in second grade to 60 in third grade. Two schools had incomplete test data; therefore they were not included. (Table IV-15)

TABLE IV-15

Number of Districts, Schools, Students and Classes by Type: STAR, 3rd Grade (1988 - 89)

	Dist.	Sch.	Pupils	Classes							
				Small		Regular		Regular With Aide		Total	
1988-89 (3)	N	N	N	N	%	N	%	N	%	N	%
Total Project	41	75	6804	139	42	89	26	107	32	335	100
Data Used for Grade 3 Analysis*	35	60	4744	110	42	68	26	85	32	263	100

*This includes students with required test scores who entered 3rd grade before November, 1988. It excludes classes of teachers who received Project STAR training.

2. Achievement Results

Sections A, B and C of this chapter provide, in parallel fashion, the results of students in three class types (small, regular and regular with a full-time aide) on achievement tests (subtests of the SAT and the BSF criterion tests) and on self-concept and motivation as measured by the SCAMIN. This section presents the same results for students in grade three. The pattern of results established in grades K, 1 and 2 has become firmly fixed. The results for the normed SAT and criterion-referenced BSF tests are essentially identical and confirmatory at all grade levels, including grade three. Table IV-I6 provides a summary of the third grade analyses on the standardized tests.

The significant difference by location ($p<.001$) is found as before, with the lowest achievement in inner city schools and achievement in the other three locations being fairly similar.

Differences in SCAMIN results by location are considerably more marked than in K, 1 and 2 and show now that the inner city students have significantly higher scores than do the students in classes in the other three locations. There is no significant class-size effect for SCAMIN results; students in all three class types score about the same wherever the classes are located. By grade three, inner city students have higher self-concepts and motivation scores as shown on the SCAMIN. The inner city students are predominantly minority in the STAR database.

The achievement results on the SAT subtests show a highly significant ($p<.001$) result favoring small classes on all measures. The regular with aide contrasts were not significant (NS) for reading, math and language but significant ($p<.05$) for listening. The location X class type analyses were all NS, showing that the class-type differences favoring small classes were consistent across all locations.

Table IV-17 shows the grade three results for the BSF test. The difference by location is highly significant ($p<.001$) with lowest scores found in the inner-city classes and the highest found in the rural schools. There are statistically significant class-size differences for reading and for reading and math combined but not for math. Since differences among class sizes were consistent for all locations, no significance was found when location X class type analysis was conducted.

TABLE IV-16

Project STAR

Grade Three Summary of Class-Size Effects Analyses, Using Class Mean Scores on Subtests of the SAT and SCAMIN

Grade 3	SAT Standardized Stanford Achievement Test - Primary III					SCAMIN Self Concept and Motivation		
	Total Reading	Total Listening	Total Math	Total Language	All Four	Motivation	Self Concept	Both
Location	<.001*	<.001	<.001	<.001	<.001 [A]	<.001	<.001	<.001 [A]
Type	<.001	<.01	<.001	<.001	<.001 [B]	NS	NS	NS [D]
Location by Type	NS	NS	NS	NS	NS [C]	NS	NS	NS [C]

[A] Means (Rounded) for Location

[B] Small class contrast significant at p<.001 for each measure and all four combined. Regular / Aide contrast is NS for Reading, Math, and Language, but is significant (p<.05) for Listening.

[C] Class type differences consistent across all locations.

[D] No consistent class type differences or class type by location differences.

*Significance Levels (p<.05) are tabled

School Type	Standardized Stanford Achievement Test Total Reading	Total Math	Total Listening	Total Language	SCAMIN Self Concept	Motivation
Inner-City	598	603	609	622	45.5	50.1
Suburban	618	617	625	635	43.5	48.9
Rural	624	628	631	640	43.8	48.9
Urban	617	616	626	632	44.3	49.3

TABLE IV-17

Project STAR

Grade Three Summary of Class-Size Effects Analyses, Using Class Percent Passing (Log-odds Index) on the BSF Tests

Grade 3, Criterion Referenced Basic Skills First Tests	Reading % Passing	Math % Passing	Both
Location	<.001*	<.001	<.001 [A]
Type	<.01	NS	<.05 [B]
Location by Type	NS	NS	NS [C]

[A] Average percent passing (rounded) for location. Average percent passing (rounded) for class type.
[B] Small class contrast significant at p<.01 for Reading and p<.05 for Math and p<.01 for both; Regular/Aide class contrast was NS.
[C] Class type differences were significant across all locations.

*Significance Levels (p<.05) are tabled

School Type	Reading % Passing	Math % Passing
Inner-City	58	55
Rural	80	82
Suburban	74	70
Urban	73	77

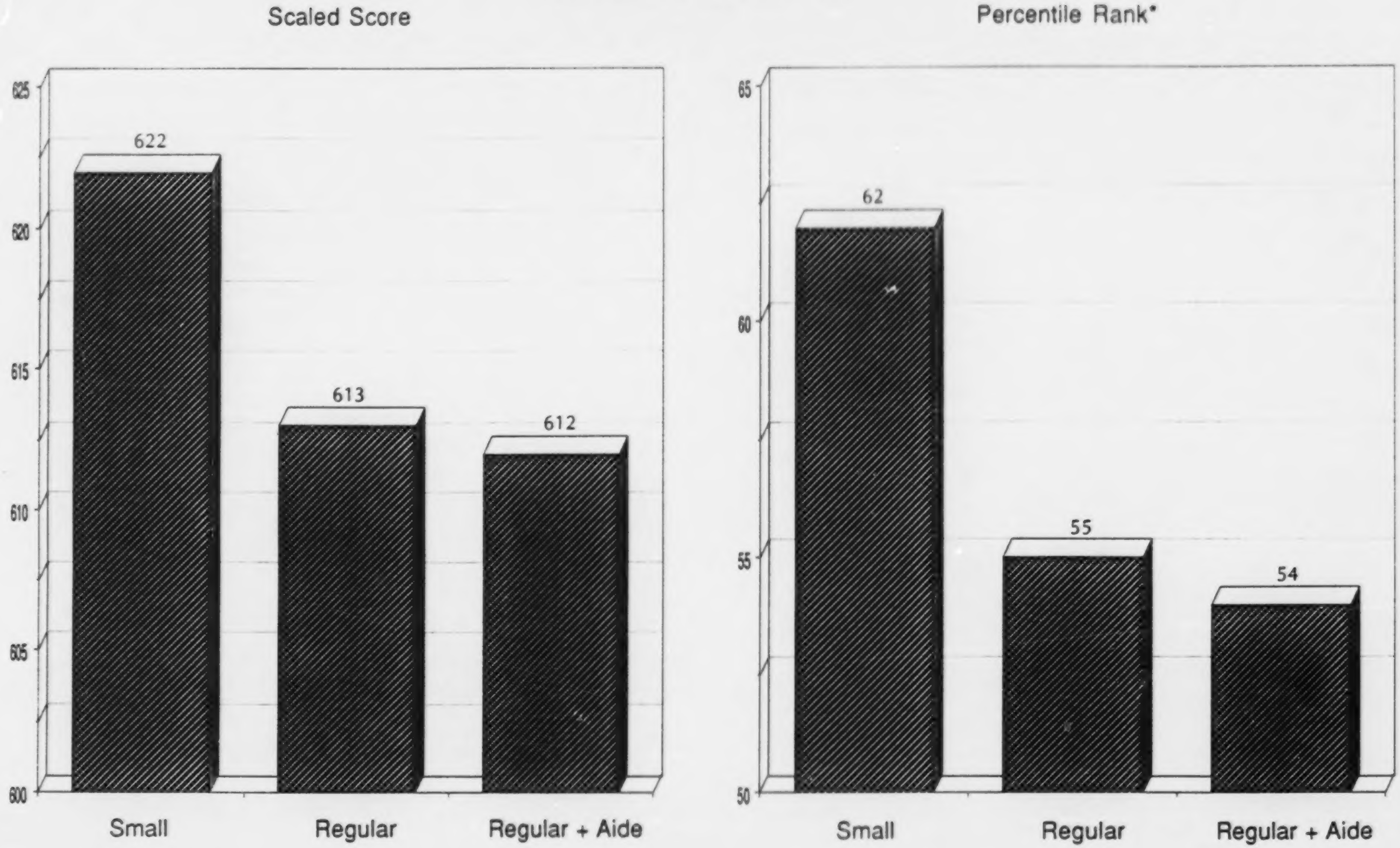
Class Type	Reading % Passing	Math % Passing
Small	77	77
Regular	70	71
Regular / Aide	70	70

3. Summary

By grade three the patterns established in kindergarten seem firmly set. A strong class-size effect is evident in all school types on standardized and criterion-referenced achievement measures (see Figures IV-27 thru IV-36).

The consistency of the finding of the small-class effect across all measures is striking. The absence of a statistically significant teacher aide effect is consistent. Differences favoring inner-city students on the SCAMIN results have, by third grade, become large enough to be statistically significant but there is no class-size effect found for SCAMIN results. A discussion of estimates of the magnitudes of the differences for grades I, 2 and 3 appears in the next section of this chapter.

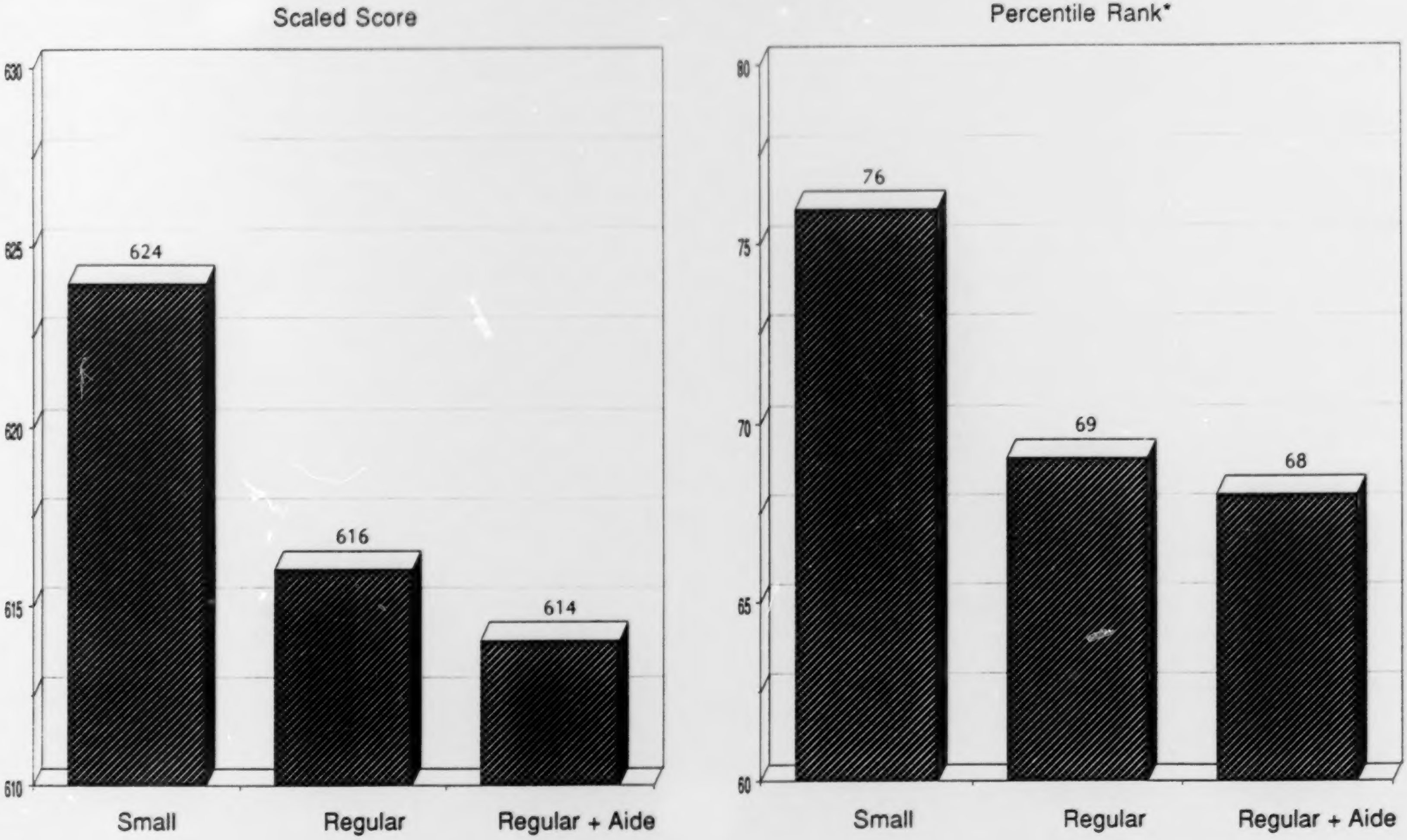
Figure IV-27
Project STAR
Third Grade Stanford Achievement Test
Total Reading by Class Type



Stanford Primary III

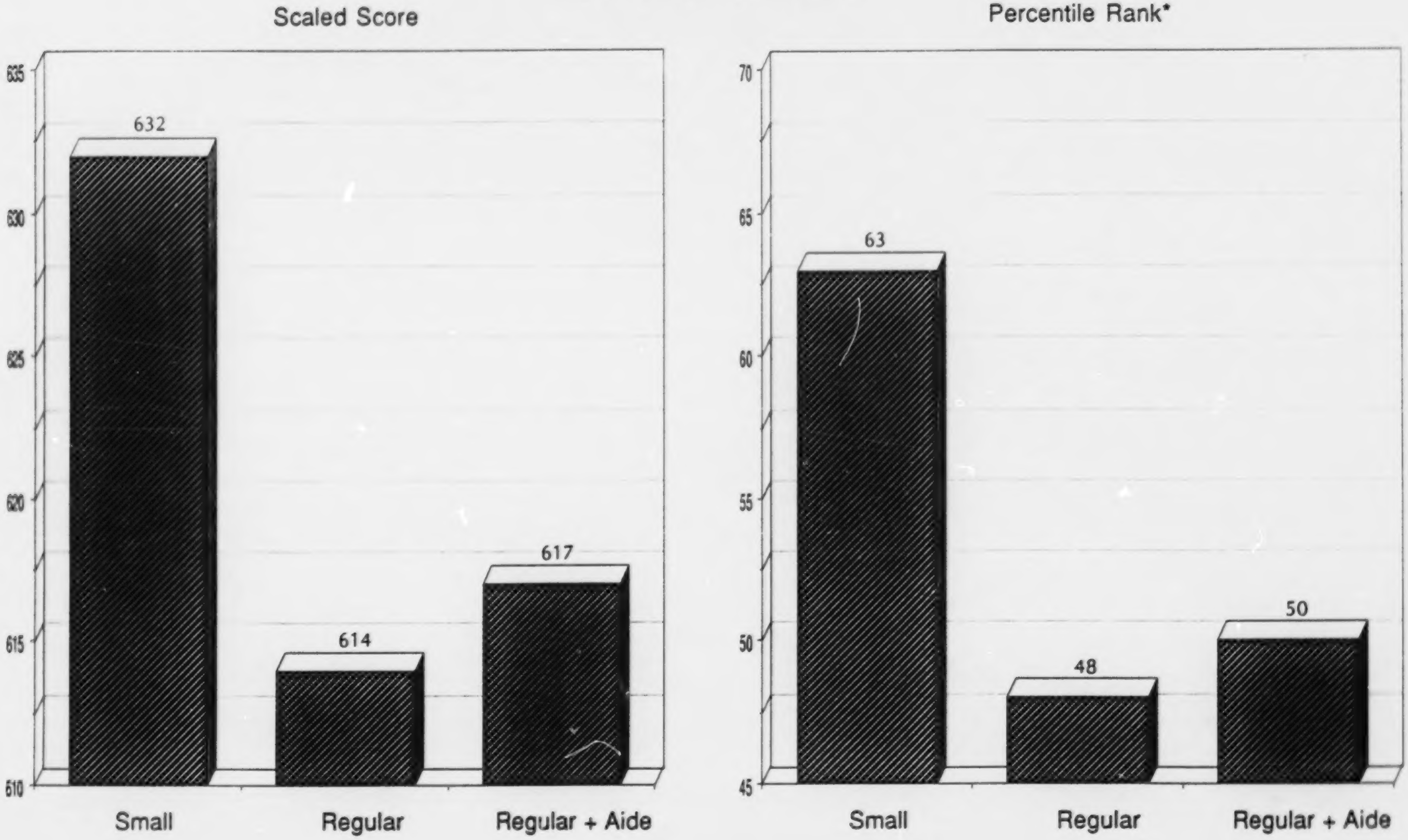
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-28
Project STAR
Third Grade Stanford Achievement Test
Total Math by Class Type



Stanford Primary III
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-29
Project STAR
Third Grade Stanford Achievement Test
Total Language by Class Type



Stanford Primary III

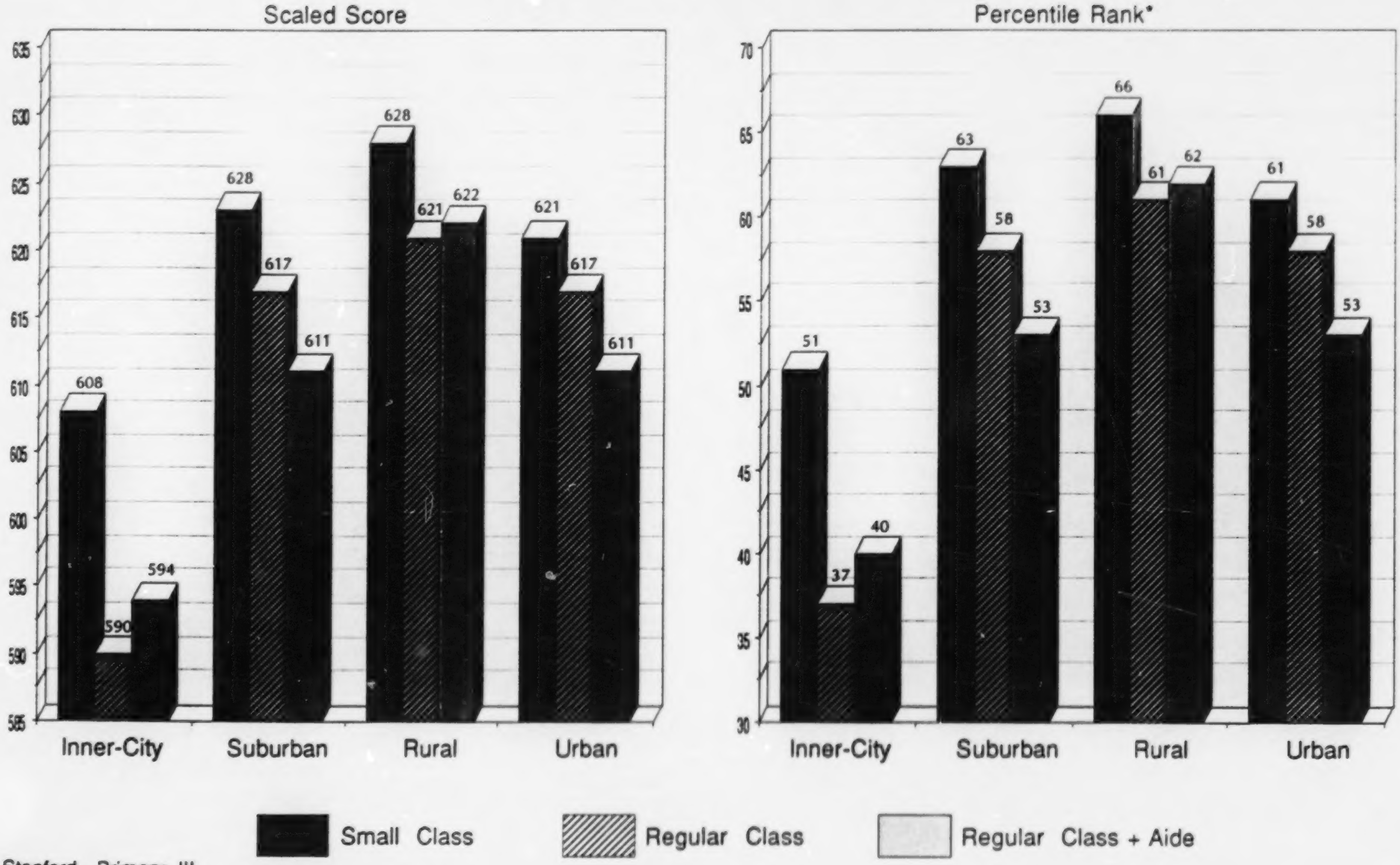
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-30

Project STAR

Third Grade Stanford Achievement Test

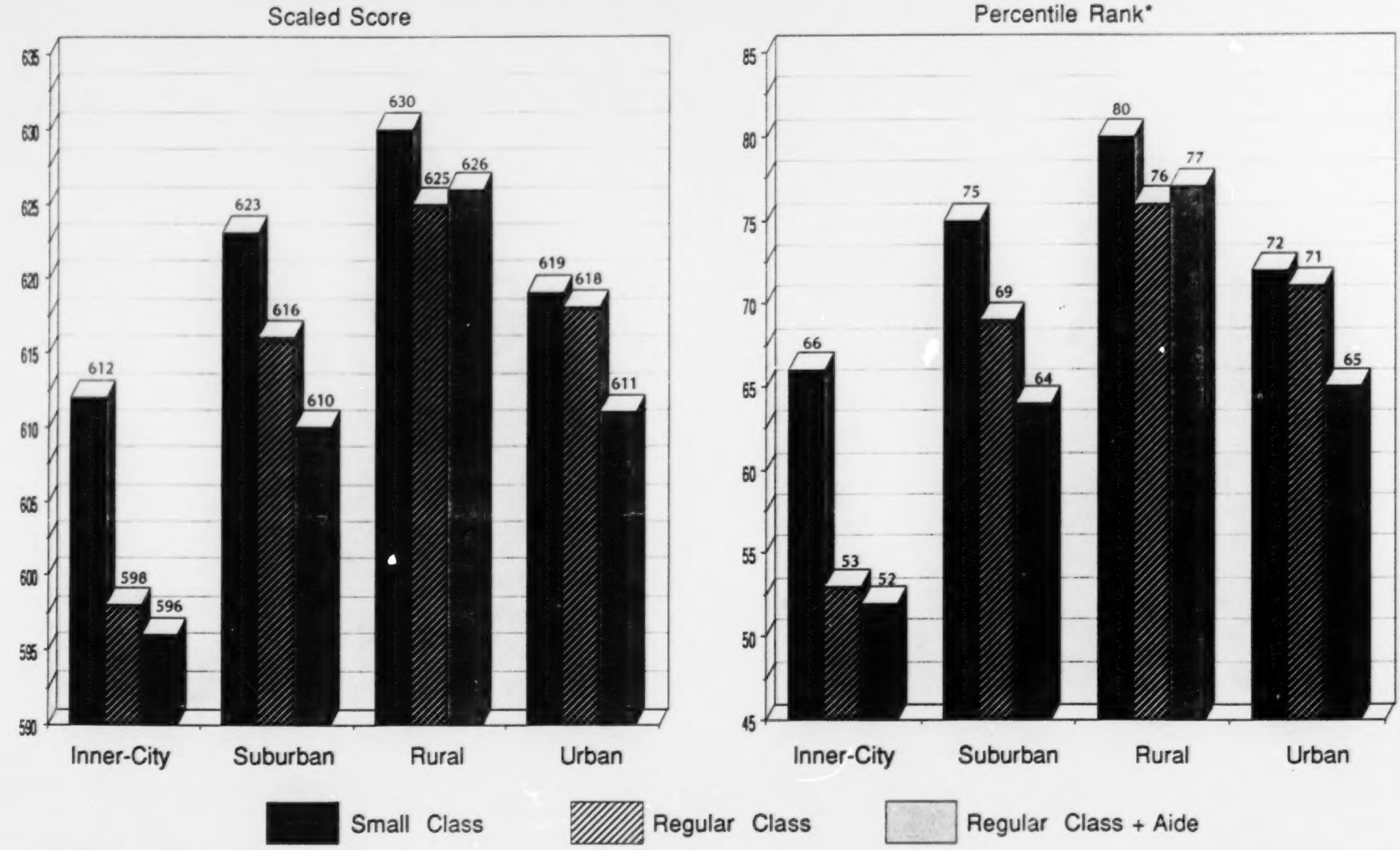
Total Reading: Class Type by School Type



Stanford Primary III

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-31
Project STAR
Third Grade Stanford Achievement Test
Total Math: Class Type by School Type



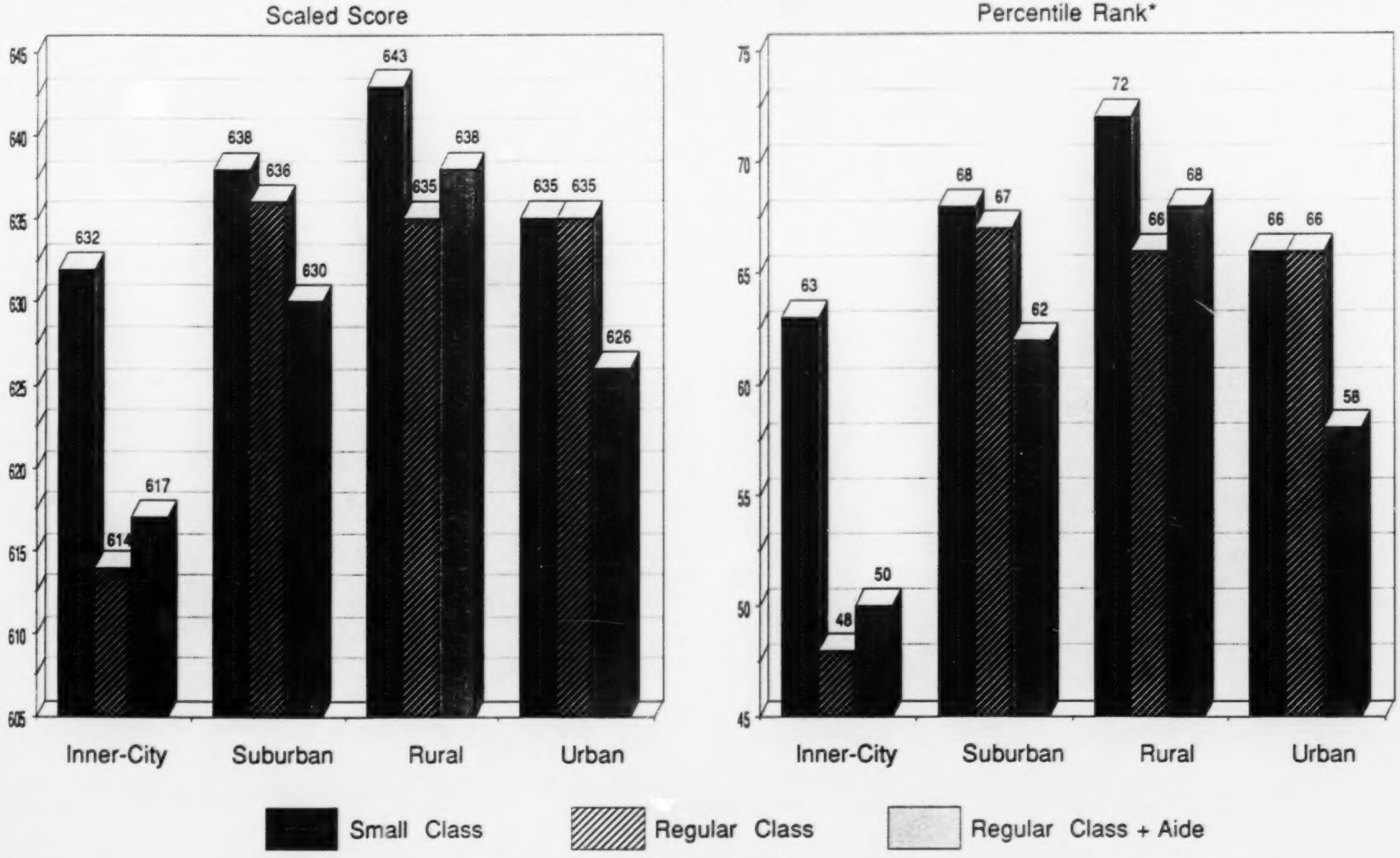
Scaled Score

Percentile Rank*

Stanford Primary III

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-32
Project STAR
Third Grade Stanford Achievement Test
Total Language: Class Type by School Type



Primary III

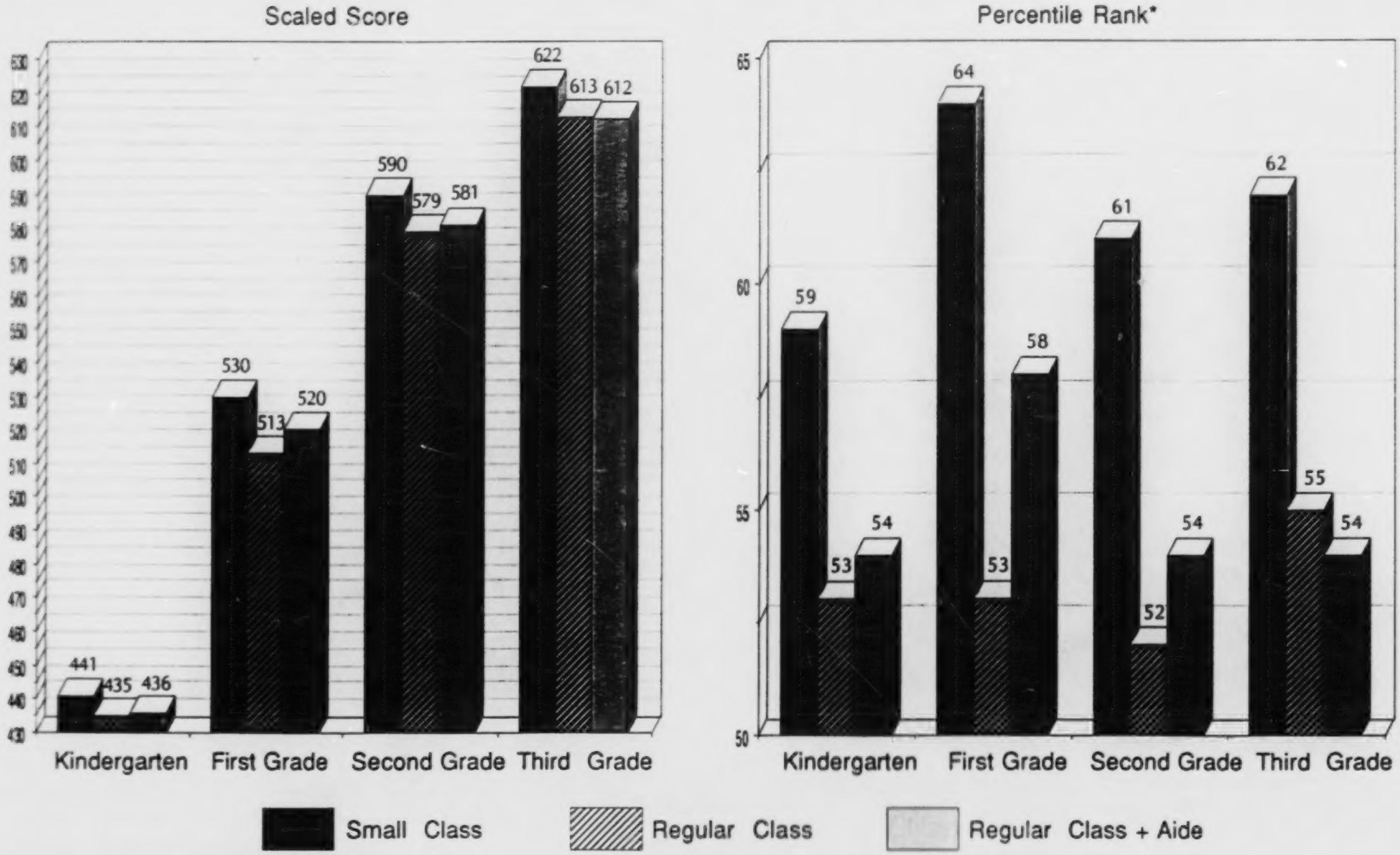
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-33

Project STAR

Stanford Achievement Test

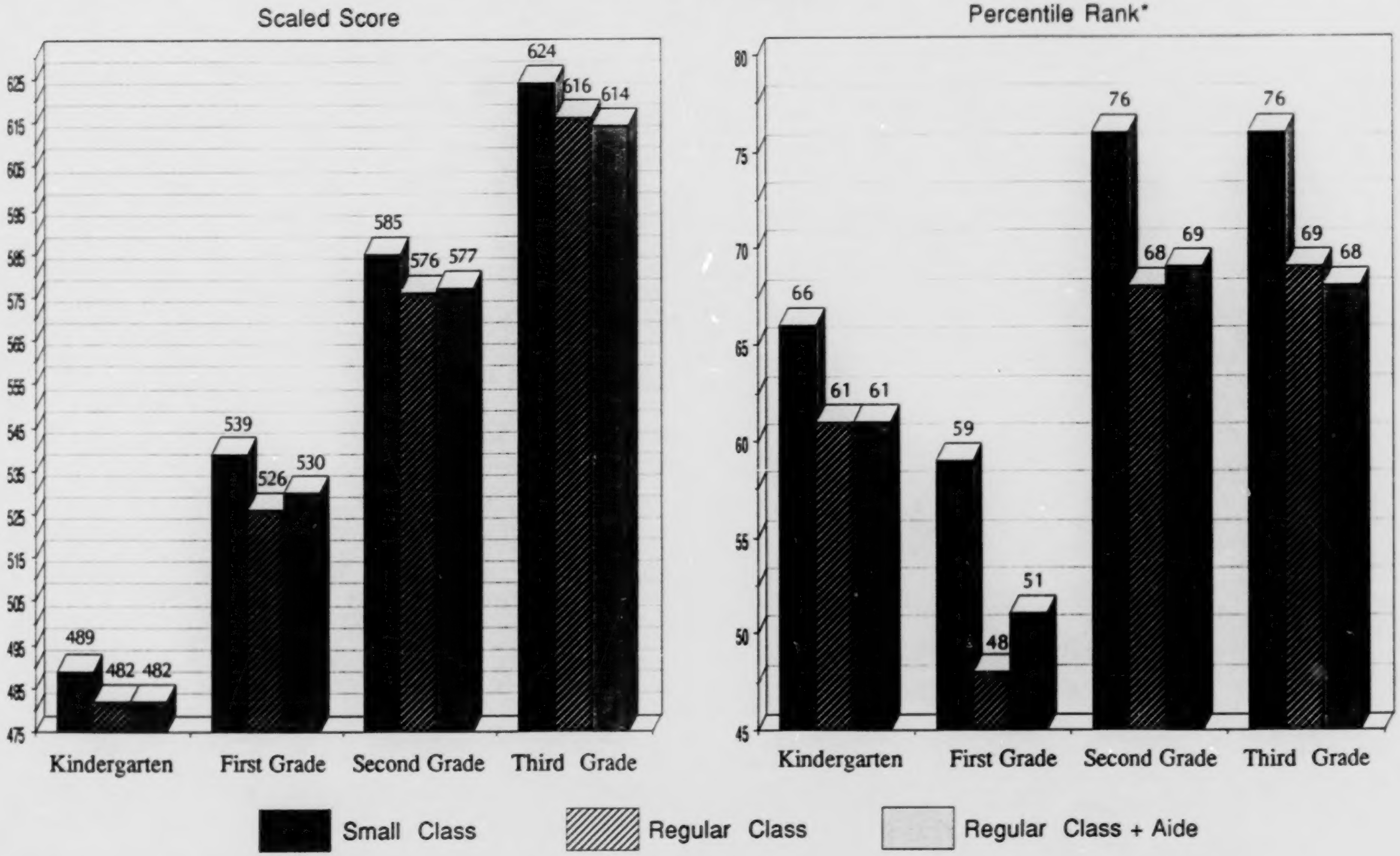
Total Reading: Class Type by Grade



Stanford SESAT II, Primary I, II, and III

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-34
Project STAR
Stanford Achievement Test
Total Math: Class Type by Grade



Stanford SESAT II, Primary I, II, and III
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-35

Project STAR

Third Grade Basic Skills First Test

Reading Skills Mastered by Class Type

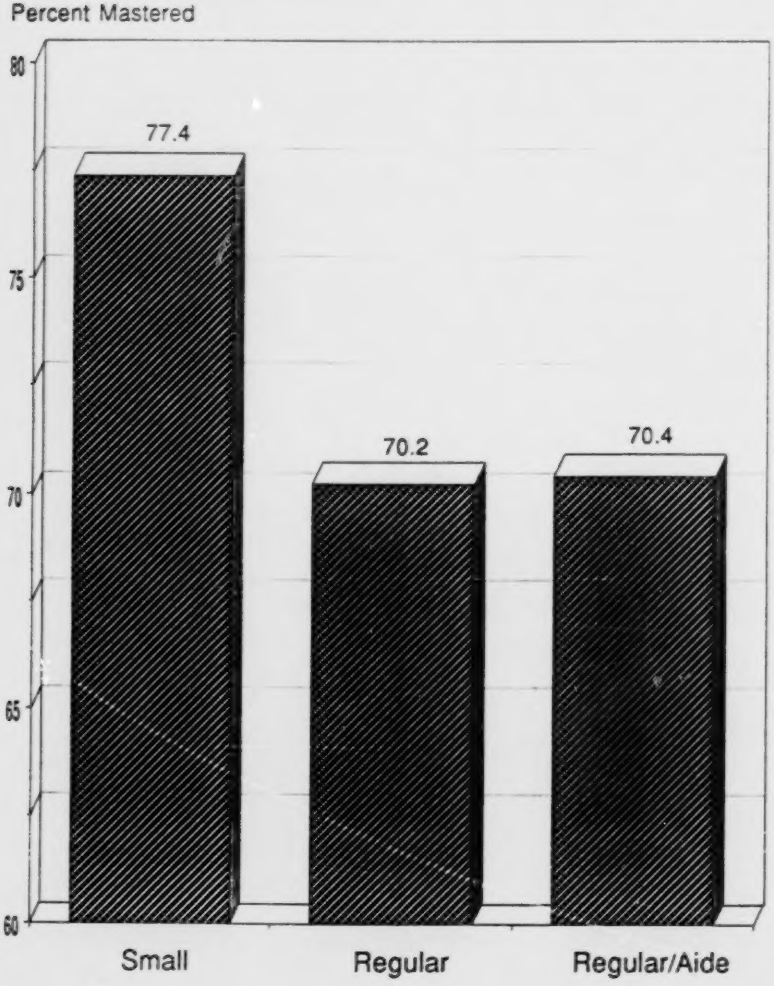
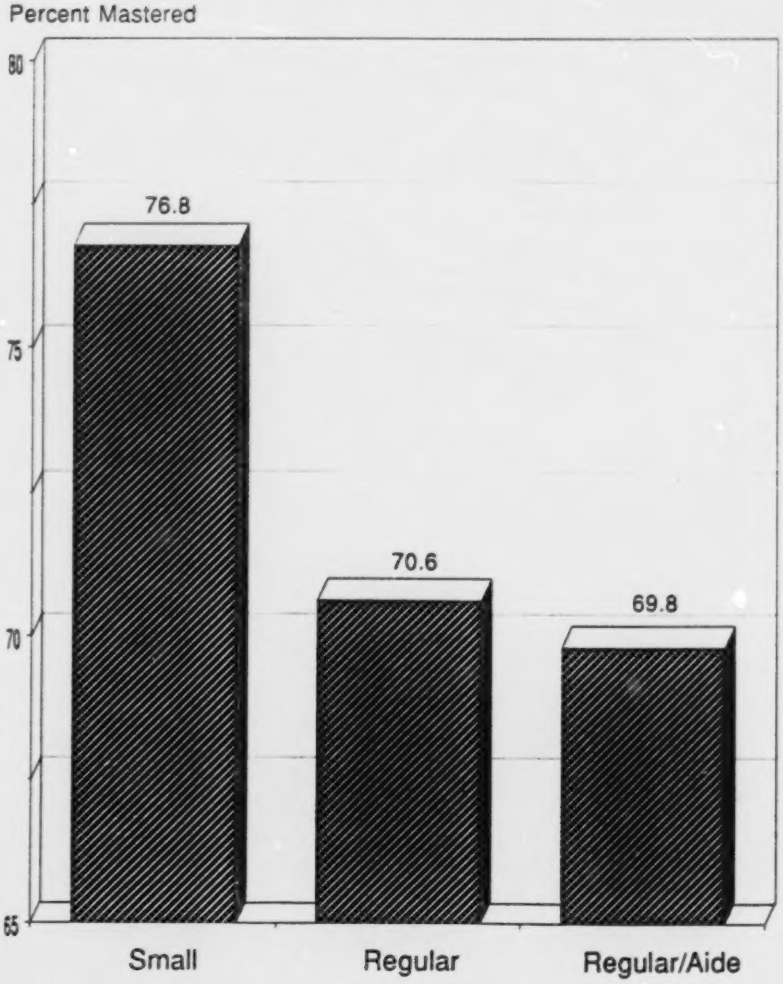


Figure IV-36

Project STAR

Third Grade Basic Skills First Test

Mathematics Skills Mastered by Class Type



F. Estimates of the Magnitudes of the Differences (Grades K,I,2,3)

One important question in this study was "How large are any small class and regular with teacher-aide class advantages?" The magnitude of difference begins to get at the policy questions upon which this study was founded and to explore the educational significance of the statistically significant results obtained. The size of the advantage can be measure by the difference in scaled score points between the small and regular classes, and between the regular/aide and regular classes as shown in table IV-18. This shows that the small class advantage increases from kindergarten to grade one, and than begins to decrease. The advantage to being in a small class remains positive, but declines in grades two and three. Both Total Reading and Total Math exhibit similar patterns, with the largest effect being in grade one.

The differences between the regular/aide and regular classes are also largest in grade one, and decline thereafter. The differences in favor of the regular/aide classes are much smaller than the differences in favor of small classes but follow the same pattern as the small-class regular-class differences. There were almost no differences in kindergarten.

TABLE IV-18

Scaled Score Differences between Small and Regular and between Regular/Aide and Regular Classes Grades K, 1, 2, and 3, Project STAR, 1985-1989

	Small - Regular				Regular/Aide - Regular			
	K	G1	G2	G3	K	G1	G2	G3
Total Reading	6.3	16.5	11.1	9.7	4.3	7.6	1.9	-0.4
Total Mathematics	6.9	13.2	9.3	8.1	-0.3	4.2	1.2	-1.6
Total Listening	---	8.6	6.8	2.7	---	3.4	1.0	-4.4

Since the interpretation of the importance of a difference depends on the variability of the measures calculated, effect sizes which are the differences between small and regular classes (or regular/aide and regular classes) divided by the standard deviation of the regular class are shown. Table IV-19 provides estimates of the small class and regular/aide class effect sizes. Table IV-19 shows the effectiveness of small classes across the four-year period using each year's cross-sectional data for total reading and total math.

The effect sizes show the same pattern as the difference scores, increasing from kindergarten to first grade, and decreasing thereafter. This is true for both total reading and math, and for the regular/aide - regular comparison.

Table IV-19

Summary of Estimates of Small Class Effect Sizes on Total Reading and Total Math, Grades K-3 Project STAR, 1985-1989.

	Group	Kindergarten	Grade 1	Grade 2	Grade 3
Total Reading	White	.18	.25	.19	.17
	Minority	.25	.52	.42	.32
	ALL	.21	.34	.26	.24
Total Mathematics	White	.20	.25	.19	.17
	Minority	.09	.38	.27	.22
	ALL	.15	.33	.23	.21

Effect sizes are also shown for whites and minorities. In reading, minorities show consistently higher results. The effect sizes were about twice as large for minorities as whites in grades 1, 2, and 3. The minority advantage in math was smaller than in reading, and in kindergarten, whites had a larger effect size than minorities.

Table IV-20 shows passing score differences in percentage points on the BSF criterion test between small classes and regular and regular/aide classes for grades 1, 2, and 3. Since the BSF tests were not scaled across grades, comparison across grade levels are not appropriate. The small-class condition is superior for white and minorities in grades 1 through 3, and minority students get a slightly larger benefit than white students. These results are similar to results shown in Table IV-18 and IV-19.

TABLE IV-20

Differences in Average Percent Passing BSF Test of Reading and Math Between Small Classes and Other STAR Classes, Grades 1, 2, and 3

	Group	Grade 1	Grade 2	Grade 3
BSF - Reading	White	4.8%	1.6%	4.0%
	Minority	17.3%	12.7%	9.3%
	ALL	9.6%	6.9%	7.2%
BSF - Mathematics	White	3.1%	1.2%	4.4%
	Minority	7.0%	9.9%	8.3%
	ALL	5.9%	4.7%	6.7%

Summary of the Principal Analyses, Grades 1-3.

A comparison of results for grades 1, 2 and 3 provided a picture of routine consistency. The classes of inner-city students consistently scored lower on achievement measures than classes of students in the other three locations. (Note that most minority students were in the inner-city classes.) The small class effect was extremely strong (significant $p < .001$) in all contrasts. Students benefited from small classes wherever the small classes were located.

The effect of a regular class with a full-time teacher aide on student outcomes was less consistent. There was some benefit to being in a class with a teacher aide in grade one, but that effect was not significant in grades two and three.

Being in a small class did not have an impact on student self-concept and motivation as measured by the SCAMIN. Students in the inner city had somewhat higher self-concept scores than students in the other locations. (Self-concept measurement of young children is difficult and results may become more stable in later years.)

V. The Longitudinal Analysis

Project STAR researchers hoped that enough students would remain in the study to allow a strong longitudinal analysis. Although each year of the study included more than 6000 students, only 1842 were in the same class-size condition for all four years (K-3; 1985-1989) of the study. Table V-1 shows the data base available for a four year longitudinal analysis. At the end of kindergarten there were no differences between results of students in regular and regular with aide classes, there was parent pressure to reassign some students, and as kindergarten was not mandatory in Tennessee there was a fairly large influx of new students. Students in regular and regular with aide classes were reassigned at random; students in small classes were not reassigned. This reassignment reduced the number of students who met the conditions for the longitudinal analysis, and newly entering students would be excluded as they lacked kindergarten scores. Thus, researchers decided to do a longitudinal analysis that had two parts: Kindergarten-Grade 1 (K-1) and Grades 1, 2, and 3 (1-3). This decision produced more students, schools and classes for the analyses. (See Table V-1)

TABLE V-1

Number of Schools, Students and Classes by Type, Longitudinal Data Base: STAR, 1985-1989*

Groups			Classes							
	Schools	Students	Small		Regular		Regular/Aide		Total	
	N	N	N	%	N	%	N	%	N	%
K-3**	54	1842	91	44	51	25	65	31	207	100
K-1	74	2416	115	38	102	33	90	29	307	100
1-3	60	2571	99	42	64	27	73	31	236	100

*In STAR in the same class type, for 4 years (K-3), or K-1 and 1-3.

**The K-3 analysis tables are in Appendix F. Those tables may be use for gross comparisons. Results are similar, but there are some noticeable differences.

To be considered in the original projected longitudinal analysis, a student had to be in the project all four years, starting in kindergarten (K), be in the same class type (small, regular or regular with a full-time teacher aide) for the entire project, and have the appropriate test scores needed for the analysis. The revised analyses (K-1, 1-3) held to the same general rules: a student was in the study for the requisite number of years and had to have all of the required test data points.

Some Caveats

The original sample (more than 6,000 students in approximately 100 classes of each of the three types) was drawn within the limits of funding and with hopes that there would remain in the study, in their same class types, enough students for a definitive longitudinal result. Throughout the study, as students moved they were replaced by other students placed at random into the three class conditions. From the original substantial data base, only 1842 students of the original kindergarten sample of 6328, or 29 percent, met all conditions for the longitudinal analysis. Using K-1 and 1-3 as longitudinal analyses bases provided more students (2416 and 2571 respectively), but even with the increase in Grade 1 the 1-3 group was still only about 34 percent and the K-1 was 38 percent.

Results of the longitudinal analysis presented here should be treated as tentative due to the restricted subsamples (about one-third of the total group) in each analysis. These youngsters may not be typical of the entire project population. Each subsample of students was divided into classes to obtain class averages for analyses. The absolute number of students for the longitudinal analysis in each of the three conditions was Small (K-1: 1140; 1-3: 891), Regular (K-1: 663; 1-3: 744), and Regular/Aide (K-1: 613; 1-3: 936). Some "large" classes had only 3, 4, 5 or 6 students who constituted the average for that class for the analysis (the same is true for other class types).

Tests of Significance of Mean Difference

Each longitudinal analysis was done for 4 measures -- Word Study Skills (WSS), Total Reading (Read), Total Mathematics (Math) and Total Listening (Listen), and for appropriate testing time points in Kindergarten, Grade 1, Grade 2, and Grade 3.

The total file analysis was a LOCATION X TYPE design, with schools nested in locations and crossed with class types. Grade differences are the dependent variables for multivariate tests of the grade effect (the specific contrasts are K-1 and 1-2, 2-3) and for interactions of grade with location and class type. This design is in Table V-2 for the K-1 analysis. Also, a race file analysis was done, using a LOCATION x RACE x TYPE design with each school having only minority or white students. This was necessitated because there were insufficient degrees of freedom for Schools x Race or Schools x Race x Type in the longitudinal data sets, making it difficult or impossible to test some effects in the completely crossed design. In this analysis, schools with location/race combinations and schools x type are the error terms for every effect of interest. This design is in Table V-3 for the 1-3 analysis.

In this analysis, the class was the unit of measure. In some class-type situations only a few students were in a class for all appropriate years. That is, throughout the project some students moved in and out of the class; only those who remained for the years of the analyses (K-1, 1-3) and had the needed test scores were used to develop the class average used in the analysis. (Appendix F contains the tables showing the numbers for the K-3 analysis with the 1842 students.)

TABLE V-2

Design for Total Class Analysis, Showing the Source of Variation, Error Terms and Degrees of Freedom, Longitudinal Study: STAR 1986-1989, Grades K-1

Source of Variation	Error Term
Grade (G)	Schools by Location (S:L)
LOCATION x GRADE (LG)	S:L
TYPE (T)	S:L
TYPE x GRADE (TG)	TxS:L
LOCATION x TYPE x GRADE (LTG)	TxS:L

	Degrees of Freedom			
	WSS	Reading	Math	Listening
Schools:Location (S:L)	56	56	56	56
Type x Schools (TxS:L)	99	99	100	99

TABLE V-3

Design for Analysis by Race, Showing source of Variation, Error Terms and Degrees of Freedom, Longitudinal Study: STAR 1985-1989

Source of Variation	Error Term
GRADE (G)	SCHOOLSxRACExLOCATION (S:R:L)
LOCATION x GRADE (LG)	S:R:L
TYPE x GRADE (TG)	TxS:R:L
RACE (R)	S:R:L
RACE x GRADE (RG)	S:R:L
LOCATION x RACE x GRADE (LRG)	S:R:L
LOCATION x TYPE x GRADE (LTG)	TxS:R:L
RACE x TYPE x GRADE (RTG)	TxS:R:L
RACE x TYPE (RT)	TxS:R:L
LOCATION x RACE x TYPE x GRADE (LRTG)	TxS:R:L

	Degrees of Freedom			
	WSS	Reading	Math	Listening
Schools:Race:Location (S:R:L)	60	63	63	63
Type x Schools:Race: Location (TxS:R:L)	93	98	98	98

TABLE V-4

Analysis of Variance Results Expressed as Significance Levels, Project STAR, Longitudinal Analysis (1985-1989) Showing the Total Class Results and the Class Results by Race

	Word Study Skills		Total Reading		Total Math		Total Listening		
	K-1	1-3	K-1	1-3	K-1	1-3	K-1	1-3	
GRADE	.01	.001	.01	.001	.01	.001	.01	.001	[A]*
LOC X GRADE	.01	N.S.	.01	.01	N.S.	N.S.	—	N.S.	[B]
TYPE	.01	.001	.01	.001	.01	.001	---	.01	[C]
TYPE X GRADE	.05	N.S.	.01	N.S.	N.S.	N.S.	—	N.S.	[D]
LOC X TYPE X GRADE	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	---	N.S.	[E]
RACE	---	.01	—	.001	---	.01	---	.01	[F]
RACE X GRADE	.01	N.S.	.05	N.S.	N.S.	N.S.	—	N.S.	[G]
RACE X LOC X GRADE	.05	N.S.	N.S.	N.S.	N.S.	N.S.	—	N.S.	[G]
RACE X TYPE	---	N.S.	—	N.S.		N.S.	---	N.S.	[H]
RACE X TYPE X GRADE	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	—	N.S.	[I]
RACE X LOC X TYPE X GRADE	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	—	N.S..	[I]

*Results are discussed on the following pages using the designations [A]-[I] to identify the results being discussed.

N.S.=Not Significant; significance levels p<.001, .01, or .05 reported.

Discussion of the Longitudinal ANOVA Results (Tables V-4 and V-5)

[A] There was statistically significant student growth on the standardized tests on all four measures and at all grade levels. This does not address class size.

[B] There were no statistically significant differences in student growth between/among the classes in the various locations (Inner City, Suburban, Rural, Urban) except in total reading for the 1-2-3 analysis where inner-city gained significantly more from G1 to G2 and from G2-G3 than all other locations. In the K-1 analysis, there were statistically significant gains between/among class types in locations, with inner-city students gaining most in Total Reading and Word Study Skills. This result does not address class size and is shown in Table V-5. Note also that Table V-5 shows that the gain in all locations was fairly similar, with a range of 77.2 to 105.7 favoring the inner city. Inner city class results were consistently the lowest and, except for K, rural classes had the highest results. Note also (Table V-5) that the largest difference between inner city score (lowest) and the highest score in any given year fluctuates from 49.4 to 24.4 with the superior gains in the inner city in G1-G2 and G2-G3 reducing the differences.

[C] Small-regular contrast is significant on all scales at or beyond p<.01; aide-regular contrast is not significant for any scale.

[D] There was no interaction with class type over years 1-3 of the study. All class types grow equally, on the average. That is, the small-class advantage which originated in K neither increased or decreased in a statistically significant manner over the subsequent three years.

[E] There were no statistically significant Location x Class Type x Grade interactions on any measures.

[F] Race effects (1-3) significant on all scales at or beyond p<.01. Whites do better than minorities on all these measures. K-1 analysis was not run.

[G] In general, grade-to-grade growth in 1-3 was similar for whites (W) and minorities (M), although the differences for the average scores for W and M were considerably less on all four measures for small classes than for the other two class types. In K-1, whites' gains, on average, exceeded gains for minorities on word study and reading. Generally, grade-to-grade growth was the same for whites and minorities, regardless of location.

[H] No statistically significant differential impact of small classes on whites or minorities.

[I] There is no evidence of a differential impact of small classes on whites or minorities, as small classes affect "growth" in each year equally. That is, there may be differential impact on end-of-year performance (see Chapter IV) but not on the total amount of change from K to 1, or 1 to 2 to 3 when students in the project are considered over time. There is no significant Race x Location x Class Type x Grade interation. However, since there were only a few locations (i.e., school types) that had both white and minority students, the test of this effect is based on very small segments of the data.

TABLE V-5

Total Reading Mean Scores by Location
STAR, 1985-1989

	K-1 Analysis			Grades 1-2-3 Analysis					
	K	Gain K-G1	G1	G1	Gain G1-G2	G2	Gain G2-G3	G3	Gain G1-G3
Inner-city	433.3	58.3	491.6	496.8	67.6	564.4	38.1	602.5	105.7
Suburban	468.1	63.6	531.7	535.8	57.1	592.9	27.5	620.4	84.6
Rural	440.9	94.4	535.3	546.2	56.8	603.0	23.9	626.9	80.7
Urban	447.3	89.3	536.6	542.5	53.5	596.0	23.7	619.7	77.2
	34.8*			38.6*		49.4*		24.4*	

*Largest difference between Inner City and any other group.

Longitudinal Average Scores By Grades, By Tests, By Class Types

Tables V-6 through V-8 show the average scores and totals for the three class types by the four locations and for grade levels K-1 and 1-3 for the two measures available for longitudinal analysis: total reading and total math. These tables also show the average growth: K-1, 1-2, 2-3 and the total growth 1-3 for each class type. Except for the scores in brackets in each table, the small class average score exceeds the average scores of other class conditions. Figures V-1 and V-2 show the average annual SAT scaled scores by class type.

Longitudinal Average Scores by Race by Class Type and Total

Table V-8 shows that on all four measures the differences between average scores of Minorities (M) and Whites (W) are far less in small classes than in regular and regular/aide classes. Average scores for (M) are considerably higher in small classes than for (M) in the other two class types, and although the average scores for (W) in small classes are higher than average scores of (W) in the other two class types, the differences are not as extreme as for (M). Minority students in small classes outperform minority students in other class types and very nearly equal the performance of white students in regular and regular/aide classes.

TABLE V-6

Average Annual Scores, Year-to-Year Growth by Class Type and Location, Longitudinal Analysis, Project STAR (1985-1989): Total Reading

	SMALL					REGULAR					REGULAR/AIDE				
	K-1 Analysis		1-2-3 Analysis			K-1 Analysis		1-2-3 Analysis			K-1 Analysis		1-2-3 Analysis		
	K	G1	G1	G2	G3	K	G1	G1	G2	G3	K	G1	G1	G2	G3
Inner City	436.4	502.9	506.1	576.6	610.0	431.1	481.5	482.6	543.5	589.4	431.8	488.3	494.5	563.4	602.2
Suburban	448.8	545.4	545.5	599.0	626.7	436.3	518.2	531.3	592.8	617.3	435.4	527.7	526.0	583.8	614.2
Rural	444.9	542.8	548.8	606.5	631.8	439.2	526.1	540.4	598.2	623.1	437.8	536.0	547.7	602.7	624.2
Urban	451.3	545.7	550.1	598.7	623.7	444.3	530.7	542.4	595.7	619.6	445.4	531.6	532.9	592.7	614.5
All	444.8	535.7	540.4	598.5	625.9	437.6	515.8	529.1	588.0	616.0	437.3	525.3	533.5	591.7	617.7

	SMALL			REGULAR			REGULAR/AIDE		
	K-1	1-2	2-3	K-1	1-2	2-3	K-1	1-2	2-3
Growth/Year	90.9	58.2	27.3	78.1	58.9	28.0	88.0	58.2	26.0

	SMALL	REGULAR	REGULAR/AIDE
Total Growth (1-3)	85.5	86.9	84.2

TABLE V-7

Average Annual Scores, Year-to-Year Growth by Class Type and Location, Longitudinal Analysis, Project STAR (1985-1989): Total Math

	SMALL					REGULAR					REGULAR/AIDE				
	K-1 Analysis		1-2-3 Analysis			K-1 Analysis		1-2-3 Analysis			K-1 Analysis		1-2-3 Analysis		
	K	G1	G1	G2	G3	K	G1	G1	G2	G3	K	G1	G1	G2	G3
Inner City	484.9	502.9	525.6	574.4	612.7	477.6	[503.9]	505.1	547.0	592.1	472.0	[508.0]	512.2	562.7	604.0
Suburban	504.2	550.0	552.3	598.3	627.1	495.9	526.8	538.6	582.7	619.8	488.2	531.2	530.8	576.3	611.1
Rural	499.4	543.6	552.1	597.6	632.1	487.0	535.6	545.5	593.9	627.2	489.7	541.1	548.3	[597.8]	628.0
Urban	500.0	547.5	548.9	585.3	617.2	487.8	536.4	[550.0]	585.2	622.6	496.7	535.4	528.6	582.5	613.4
All	497.5	541.8	547.0	592.4	626.0	486.5	527.2	537.7	582.9	619.4	487.1	532.7	537.1	586.4	619.3

	K-1	1-2	2-3	K-1	1-2	2-3	K-1	1-2	2-3
Growth/Year	44.3	45.4	33.6	40.7	45.2	36.4	45.6	49.2	32.9

	SMALL	REGULAR	REGULAR/AIDE
Total Growth (1-3)	79.0	81.6	82.1

TABLE V-8

Average Annual Scores and Differences Between the Scores of White (WH) and Minority (MIN) Students By Class Type and Total on Two Measures Longitudinal Analyses: Project STAR, 1985-1989, K-1 and 1-2-3

TOTAL READING

SMALL REGULAR REGULAR/AIDE TOTAL

K-1 Analysis 1-2-3 Analysis K-1 Analysis 1-2-3 Analysis K-1 Analysis 1-2-3 Analysis K-1 Analysis 1-2-3 Analysis

	K	G1	G1	G2	G3	K	G1	G1	G2	G3	K	G1	G1	G2	G3	K	G1	G1	G2	G3
WH	449.8	542.4	609.2	631.5	444.9	537.0	604.3	625.8	444.0	536.9	606.4	626.2	446.6	539.1	607.0	628.2				
MIN	438.0	517.0	582.2	612.7	419.4	504.9	559.2	596.0	423.8	498.4	569.1	596.9	431.2	509.9	575.0	605.8				
DIF	11.8	25.4	27.0	18.8	25.5	32.1	45.1	29.8	20.2	38.5	37.3	29.3	15.4	29.2	32.0	22.4				

TOTAL MATH

SMALL REGULAR REGULAR/AIDE TOTAL

K-1 Analysis 1-2-3 Analysis K-1 Analysis 1-2-3 Analysis K-1 Analysis 1-2-3 Analysis K-1 Analysis 1-2-3 Analysis

	K	G1	G1	G2	G3	K	G1	G1	G2	G3	K	G1	G1	G2	G3	K	G1	G1	G2	G3
WH	502.9	548.2	555.0	600.2	632.4	489.4	538.5	546.9	594.0	626.6	492.7	541.0	545.6	594.6	626.2	495.6	543.0	549.8	596.7	628.8
MIN	485.2	524.2	530.9	577.3	613.0	481.5	507.0	517.6	554.9	597.2	476.0	514.4	520.5	567.9	602.3	481.7	515.8	523.8	567.8	605.1
DIF	17.7	24.0	24.1	22.9	19.4	7.9	31.5	29.3	39.1	29.4	16.7	26.6	25.1	26.7	23.9	13.9	27.2	26.0	28.9	23.7

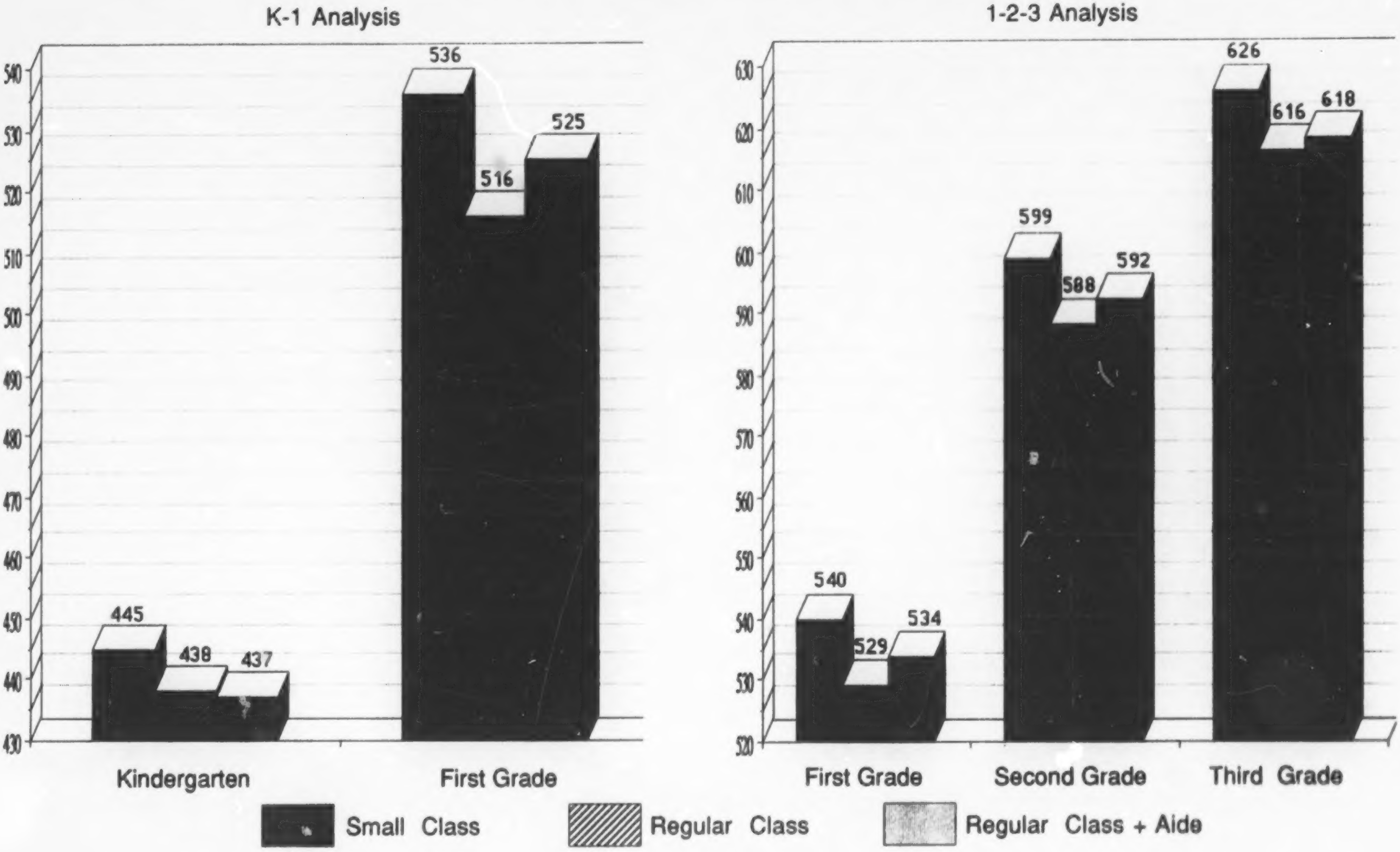
WH=WHITE MIN=MINORITY DIF=DIFFERENCE

Figure V-1

Project STAR

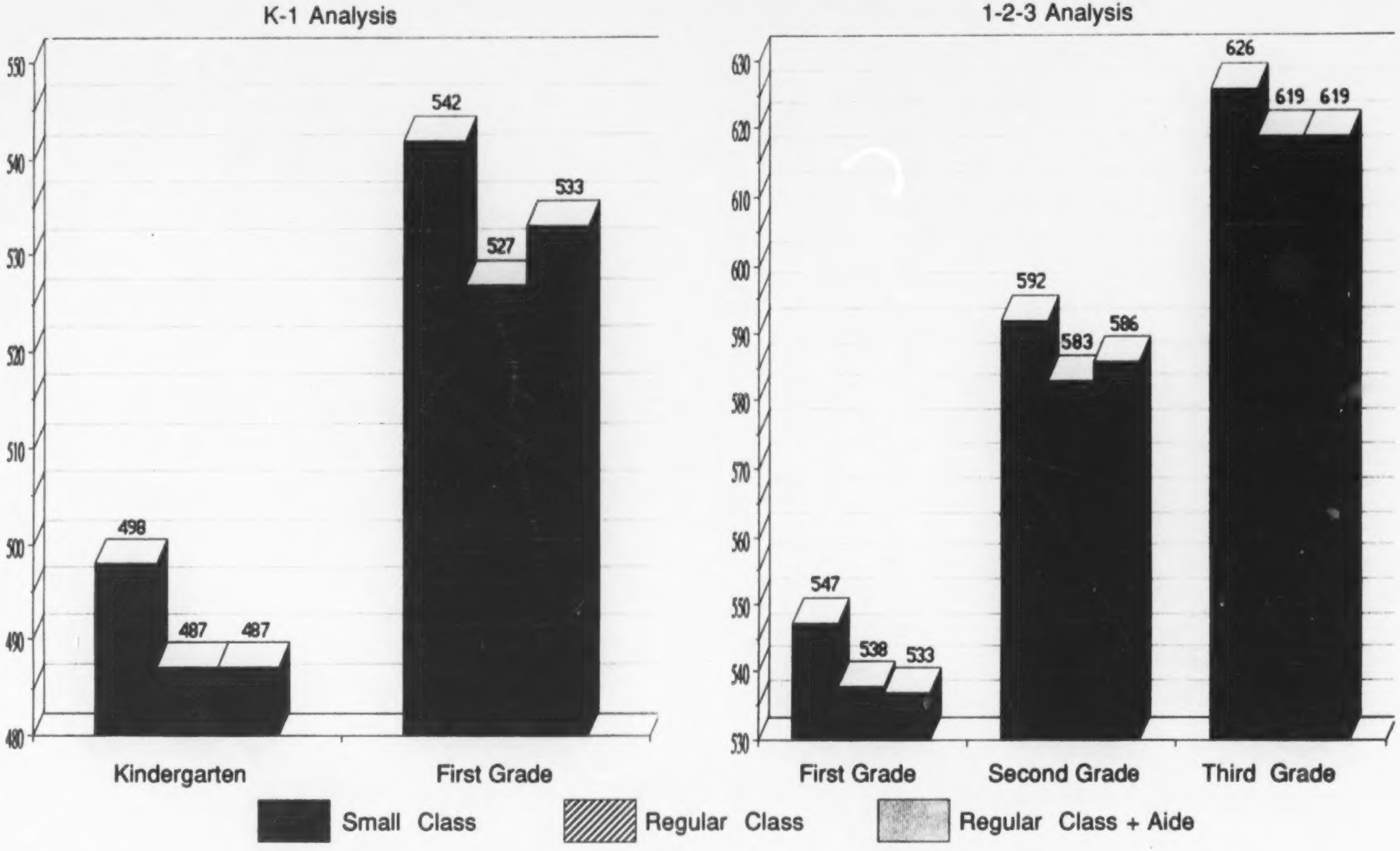
Average Annual Scaled Scores, Year-to Year Growth by Class Type

Longitudinal Analysis, (1985-1989): Total Reading



Stanford SESAT II, Primary I, II, and III

Figure V-2
Project STAR
Average Annual Scaled Scores, Year-to Year Growth by Class Type
Longitudinal Analysis, (1985-1989): Total Math



Stanford SESAT II, Primary I, II, and III

SUMMARY COMMENTS

Although each yearly analysis continued to identify the benefits of a student's being in a small class, the results for the small (about 33 percent) subsample of students in the same class size for 2 years (K-1) and 3 years (1-3) were less definitive for student achievement. The results showed that the large and statistically significant gains favoring the small classes made in the first year (i.e., K in the K-1 comparison and Grade 1 in the 1-3 comparison) were maintained, but that there were no statistically significant gains in future years. Likewise, the average scores on the four measures of achievement (detailed tables provided for Total Reading and Total Math only) used for the longitudinal analyses showed that the minority students in small classes achieved higher scores than minority students in the other class conditions, but the non-minority students continued to outperform the minority students in all class types and locations.

VI. Training

A. Introduction

One of the recurrent explanations in the literature for failure to find significant class-size effects is that teachers are teaching the smaller class the same way they have taught a large class and therefore student achievement is not greatly affected.

Most of the research on class size has measured overall effects on student achievement; only a few have examined how teacher behavior changes when class size is reduced (Fox, 1967; Taylor + Fleming, 1972; Wright, et al., 1977, Cahen, et al., 1983; Whittington, et al., 1985.) These studies are summarized in Robinson and Wittebols (1986) as follows: "Research indicates that many teachers, whose classes are reduced in size do not change their teaching techniques (p. 134). Fox found that 55 percent of the teachers made ineffective use of smaller classes; 45 percent did more individualization of instruction. Cahen, et al.(1983) showed that smaller classes had more on-task and engaged time and less time waiting for teacher help. Wright (1977) and Taylor and Fleming (1972) found that teachers in small classes gave students more individual attention. Whittington, et al. (1985) found that teacher logs revealed more individualization, better student behavior, more student participation, and faster pace in smaller classes.

What teachers need to do to teach effectively in a small class does not appear from the literature to differ very much from good teaching in a large class; if they can individualize instruction, increase time on task, and motivate students, the students will learn more. The small class makes these things possible, and a training program should help teachers achieve the possible. Training teachers to work with a teacher aide is a little more complex, because it involves defining roles and developing a teamwork approach to the class.

B. Project STAR Legislation

The Project STAR legislation (Appendix A) specified that teachers should receive in-service education, without specifying the nature or extent of the training. Almost all of the teachers in Project STAR were already involved each year in a variety of in-service education activities. The Project STAR training program would be "in addition to" the in-service training they would normally get. Their usual training varied from school system to school system, and in some systems, individual schools chose what they would do. Teachers with whom we discussed the possibility of a training program agreed that it was a good idea, but it did not seem to be a high priority with most of them. The average teacher in the second grade had 13 years of teaching experience, and the third grade teachers had 14 years of teaching experience. Most of the teachers felt that they knew what and how to teach.

An advisory committee was formed to help plan the training program. The members included training specialists from the State Department of Education, from local systems participating in Project STAR, as well as a superintendent, principal, and teachers from STAR schools.

Vanderbilt University had the major responsibility for planning and conducting the training program statewide, although each of the other universities was involved in the observation of teachers and other data collection activities.

C. Background on Training

1. Training Design

In the winter of 1986-87, 13 of the 75 STAR schools were selected randomly within school types to have their teachers trained. In the selected schools, all of the teachers were trained; there were 57 teachers, 17 percent of the total number in Project STAR. All but two of the initially selected schools agreed to participate, and the two refusals were replaced by other randomly selected schools from the same school type. There were two inner-city schools, two suburban schools, two urban schools, and seven rural schools in the training group. In 1987-88 there were 21 small, 19 regular, and 17 regular/aide classes in the training schools. In 1988-89 there were 25 small classes, 15 regular, and 17 regular/aide classes in the same schools.

In the second grade, 30 percent of the trained teachers had more than 20 years of experience; only 4 of the 57 had less than three years of experience. Within the previous three years about 80 percent had participated in in-service training designed to increase their ability to manage classrooms and increase student learning. As a group, they were not highly motivated to take additional training. The third grade trained teachers were similar in demographic characteristics to the second grade teachers; both groups were similar in demographic characteristics to the Project STAR teachers who were not in the training group.

The training design in both second and third grade involved three days of training before school. Teachers were paid $35 a day to participate. In second grade there were also five, one-hour follow-up sessions, one a month on the average, where the trainers worked with teachers on the improvements they were trying. In the third grade there were three, two-hour follow-up sessions, one each in September, October, and November.

2. Training Curriculum

Dr. Hilda Nason, an experienced trainer, developed the curriculum for the three-day before-school training, with the assistance of an advisory committee of teachers, trainers, and State Department of Education supervisors who reviewed the objectives and made suggestions for the content of the program. The teachers who were to be involved in the training program responded to a questionnaire which listed a number of possible curriculum topics. In addition, the teachers indicated the topics covered by in-service training they had received in the previous three years.

Dr. Nason used these inputs to develop the curriculum and training syllabus which emphasized classroom management, teaching higher order thinking skills, diagnosing students' learning needs, individualizing instruction, and working with aides in the classroom.

The training program was initiated in 1987-88, when the STAR students were in second grade. The second grade teachers in the training schools were observed teaching a reading and a math lesson in the spring of 1987, before they had received any training. Training was provided to five groups of 10 to 15 teachers each in August 1987, before school started. Dr. Nason trained one group of ten teachers. The four other trainers observed Dr. Nason's training sessions. They all used the same training manual that Dr. Nason had developed to try to provide the same content to all teachers. The trainers were all highly rated (over 4.5 on a 1 to 5 scale) in the teacher post-training evaluations of their sessions. Training sessions were observed by other members of the Project STAR staff and the evidence is that training was of uniformly high quality and that the content of all training sessions was comparable. In the second grade, the same curriculum was delivered to all teachers, regardless of whether they were going to teach a small, regular, or regular/aide class. Teachers had not received their class type assignment at the time they were trained.

The training for the third grade teachers did include one day of condition-specific training and two days of general training in classroom management and teaching thinking skills that was similar to the second grade training. Teachers knew their class-type assignment (small, regular/aide, or regular) at the time of training. Aides participated in the condition-specific day of training, along with their teachers.

A major emphasis in the training in both years was to try to get teacher commitment to implement ideas and concepts from the training in their classrooms. Each teacher was asked to make a specific commitment in writing at the end of the summer training about what they would do in the coming school year to improve their teaching.

In second grade the trainers held live follow-up sessions of about an hour's length each month during the fall at the schools or at a teacher center. In third grade there were three two-hour follow-up sessions in the fall. The trainers also observed each teacher in her or his classroom during the day of one of the follow-up sessions. The follow-up sessions were designed to help teachers implement their commitments to improve their teaching. The follow-up sessions were individualized to respond to teacher interests and did not try to cover a uniform curriculum.

Each teacher in the training program was observed teaching a math lesson and a reading lesson in the fall and again in the winter. For each teacher there was one before-training observation, one observation during the follow-up period in the fall, and one in the winter after the follow-up sessions had been completed. Trainers also did an overall evaluation of the teachers' implementation of the training based on their classroom visits and on their interactions with the teachers during the follow-up sessions.

Observations were also made of 32 teachers in Project STAR schools that were not involved in the training program.

The design permits comparisons between the classroom teaching of trained teachers and of untrained teachers . Comparisons can also be made between observations made before training and after training of the same teachers. Finally, the design permits comparison of teaching behavior of teachers in small classes, regular classes, and classes with a full-time aide. In addition to the observation of teaching, comparisons were made of student achievement between trained teachers and teachers who have not been trained.

3. Observer Training

Observers came to Vanderbilt for a two-day training session prior to spring data collection in 1987. They were given manuals describing the observation system, classroom rating scales, and the data collection instruments and procedures. The observation system provided for descriptive notes as well as for coding specific categories of teacher-student contacts and student task engagement. (See Evertson & Burry, 1989, for a description of the observation system.) Observers practiced using the observation system categories by coding scripted dialogues of teacher-student interactions in class lessons, by contributing their own dialogues for practice, and by coding videotapes of actual class lessons. Throughout training, guidelines for writing "descriptively" rather than "judgmentally" or "evaluatively" were emphasized. At the conclusion of

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training, observers used the observation system and the classroom rating scales to record, code, and rate events on a master videotape of a complete class lesson. Criterion-referenced agreement was computed. Agreement with the coded master tape was high (85 percent or above) for the observation system and 80% for the classroom rating scales.

Follow-up contacts with the observers and data from the spring 1987 data collection were used to assess observer agreement. Observers reported little difficulty in using the system since the descriptive notes allowed them to record what they saw and to explain any anomalies that might affect their quantitative data. Prior to the data collection in fall 1987, observers returned for another two-day session. Approximately half of this time was used to talk about classroom events that affected what they recorded. Although agreement was high, observers' scores were not perfect. The primary threat to agreement appeared to be observers' failure to record events because they did not see them, not their failure to interpret observed events accurately. Observer training was conducted again in early September, 1988. At this time, new observers were trained and the skills of those observers who remained with the project for the second year were reinforced.

4. Assessment of Training Effect

To assess the effects of training, trained observers recorded a variety of information (e.g., classroom management, teacher-student interaction, on-task behavior) as teachers taught a reading and a math lesson to their students. Observations were made three times. The first observation was in the spring of the previous academic year. These data provide a pre-training standard. The second observation was in late fall after training (post-training comparison). A third observation was in the winter after a series of at least three follow-up sessions in which the observers met with the teachers to discuss their implementation of the training curriculum.

One primary interest of the project is the effect of training on classroom dynamics. One way to address this issue is to compare the pre-training observations with the post training observations for those teachers who received training. But we concluded that classroom activities at the end of a school year vary considerably from those at the beginning. Hence, the pre-training data do not provide the benchmark for pre- and post- comparisons we would have desired. In other words, any differences in classroom dynamics between pre- and post- data might reflect these naturally occurring differences in the cycle of the school year rather than any real effect of training.

Consequently, we selected eight additional schools whose teachers did not participate in the STAR training program. An effort was made to select schools that were in the same school districts and "school type" (e.g., urban, rural, suburban, or inner city) as those selected for the training program. Selection was constrained somewhat, however, by the proximity of the schools to the trained observers we had available to collect the data. Observers collected the same information on these teachers as on the trained teachers. Hence, the data enable us to assess the effect of training by comparing the observations made of the trained and untrained (or comparison) teachers at the same time in the school year. The comparison group of second grade teachers was observed in the fall of 1987; the third grade group was observed in the fall and winter of 1988-89. Only fall data, then, are available for both academic years for both groups of teachers--trained and comparison.

5. Class Type and Teaching Practices

All of the approximately 340 teachers in both the second and third grades, including the 86 second grade teachers and 84 third grade teachers who were observed for this training study were also randomly assigned to one of three class types: small, regular or regular/aide. Table VI-1 shows the number of teachers by class type for each of the six possible categories of analytical interest for both years of the training study.

Data Analysis

The principal questions of this research are: Does training affect teaching practice (e.g., development of procedures, routines, class management, etc.)?; Do these dynamics vary by class type; and Does any effect of training depend on the particular type of class to which a teacher has been assigned--that is, do class type and training interact? The effect of training on student achievement is also a primary issue. To address these issues, the MEANS and REGRESSION programs available in SPSS-X were employed. MEANS provides the means on variables of interest for each group--trained vs. comparison; small vs. regular vs. regular/aide classes--as well as a test of the significance of the differences. The question of interaction--that is, whether training effects may vary by class type--was addressed with regression analysis using dummy coding.

D. Results

Key variables derived from the category coding section of the observation system are shown in Tables VI-2, VI-3, and VI-4. The observation coding sheet provides for recording teacher-to-student contacts and student-to-teacher contacts in either behavioral, academic, or procedural contexts. Observation time is defined as the actual number of minutes of observation divided by 60. The number of contacts in each category is summed and divided by observation time to obtain a rate per class hour. Proportions of time spent in each activity are calculated by computing the minutes spent in the activity and dividing by observation time. Effect sizes were then calculated for each training group and class type. Variables with effect sizes of .30 or higher are reported. Comparisons among small, regular, and regular/aide classes are shown for math and reading.

All variables from the observation system and classroom rating scale variables are analyzed for each of the three class types and two training conditions for fall observation data only. This time period was selected because the data for the training and comparison groups are the most directly comparable. No data were collected in comparison classes for the winter time period. However, the decision to use these data means that at best we will be attempting to capture the most immediate effects of training on teaching practice in different class types as opposed to the longer term effects that might be captured from using the winter observation data. The winter and fall observation data were compared, however, and very few differences were found for observation variables across the two time periods. Classroom ratings were completed at the end of the observation period for both math and reading lessons; therefore, there are no separate ratings for subject matter for these variables.

The analysis of the classroom rating variables and observation variables was conducted in three steps for each grade. First, the effects of the training program were determined by comparing training and comparison classrooms, regardless of class size. Training effects are summarized in Tables VI-2, VI-3, and VI-4. Next, class type effects were determined by comparing means for small, regular, and regular/aide classes, regardless of training group assignment. Results are summarized in Tables VI-5, VI-6, and VI-7. Third, interaction effects, that is, the possibility that the effects of training might depend on class type, were also considered. Training and comparison groups were disaggregated by class type in order to test for interaction effects. Significant interaction effects are summarized in Table VI-8. A summary of all effects is presented in Table VI-9.

1. Time Spent in Subject Matter and Lesson Formats (Variables 1-7)

Class means were remarkably similar across class types and grades, both in the amount of time spent in the subject matter and in lesson formats (see Tables VI-6 and VI-7). Class type made no significant difference in the amount of time spent in reading or math; in all class types, more time was spent in reading than in math. Note that the same amount of time spent in a small vs. a regular class can actually result in more time spent per student, meaning that students in small classes may have more turns at the chalkboard in math and more of the teacher's attention in reading.

Reading lesson formats were very similar regardless of class type. In reading lessons, time was spent mainly in small group instruction, with most of the lesson spent in content development, some time spent in independent seatwork, and a much smaller amount of time spent in testing and giving directions for assignments. Third grade classes spent more time in independent seatwork than second grade classes; otherwise, second and third grade reading classes were very similar.

Math lessons across class type and training groups were different from reading lessons but very similar to each other. Small groups were rarely used in math instruction. Most math lesson time was spent in content development, with longer periods of time spent in independent seatwork in math than in reading. These differences in instructional format could contribute to the difference in findings for training and class type effects in reading vs. math.

While no important differences were found among class types, some training effects were apparent in lesson format in math and reading in the second grade (Table VI-3 and VI-4). Trained second grade teachers spent significantly more time in content development in both reading and math than comparison teachers. In reading, trained teachers spent less time in small group instruction than comparison teachers; in math, trained teachers spent less time in independent seatwork than comparison teachers. However, training effects for these variables were not observed in third grade classes.

2. Teacher-Student Contacts (Variables 8-29)

Neither the number nor the types of teacher-student contacts differed by class type in second or third grade reading or in second grade math. Teachers appeared to maintain the same pattern of instruction regardless of class size. In third grade math classes, however, several class type differences were observed (see Tables VI-6 and VI-7).

In third grade math, more of the total contacts were teacher-initiated in regular classes than in small classes. These findings imply that students initiated more contacts in small classes than in regular classes. Means for variable 10 (Table VI-7) support this possibility, although the differences were not statistically significant. The data do indicate that students in small classes may have initiated more procedural contacts than students in regular classes, although this finding was not significant ($p = .10$). Regular classes also had more total academic contacts than regular/aide classes and more questions than either small or regular/aide classes.

The types of contacts teachers initiated varied in some cases by class type. For example, in third grade math, teachers were more likely to initiate questions and make academic contacts in regular classes than in small classes or regular/aide classes.

The same patterns described above for math were observed in third grade reading. However, the differences between means are not statistically significant, with one exception. In third grade reading, small classes and classes with teachers' aides spent a higher percentage of class time in academic activities than did regular classes.

Some training effects were apparent in teacher-student contact variables in reading classes, but not in math classes (Table VI-3 and VI-4). More of the total contacts in training classes were questions, and fewer of the total contacts in second grade training classes were directives (direct statements to students that require them to respond as opposed to questions or comments). Trained third grade teachers initiated fewer questions than comparison teachers. Trained second grade teachers initiated more comments than comparison teachers. Fewer of the total contacts in second grade training classes were directives.

In addition to the direct effects of class type and training noted, some interaction effects also surfaced. Training effects varied depending on class type on two variables (see Table VI-8). In second grade math, trained teachers in small and regular classes had fewer procedural contacts than comparison teachers, but trained teachers with classroom aides had more procedural contacts than comparison teachers. In third grade reading, trained teachers in small classes and classes with teacher aides made more directive contacts than comparison teachers; in regular classes, however, trained teachers made fewer directive contacts than comparison teachers. These apparent interactions are important to consider because they can explain why direct effects of either training or class type are sometimes nonsignificant.

3. Student Outcome Variables (Variables 30-33)

Training and class type each had effects on student task engagement. Direct class type effects were present in second grade reading, where students in small and regular/aide classes had fewer students probably on-task and more students definitely on task than students in regular classes (see Tables VI-6 and VI-7). A similar effect was observed in third grade reading, where significantly more students were probably on-task in training classes than in comparison classes, with no significant difference in the percentage of students definitely on-task. These results were probably related in part to the finding in grade 2 that small classes have better visibility than regular classes: it may have been easier for observers to see whether students were definitely on-task in the less-crowded classrooms.

As Table VI-8 shows, the two variables training and class size interacted on the percent of students probably on-task (Variable 31), with the highest percentage of students probably on-task in regular training classes. Variation in on-task behavior due to training depends on the class type observed. Thus, unique combinations of training condition and class type contributed to the observed effect in the second grade.

An interaction between training and class size may have masked an effect on the percent of students waiting in second grade reading. Fewer students were observed waiting in small classes and classes with teacher aides, although this difference was not significant ($p = .10$). Table VI-8 shows that, while there was no difference on this variable in small training or comparison classes, training had opposite effects in regular classes than in classes with teacher aides. Thus it appears that unique combinations of training and class size affected the percent of students waiting.

4. Classroom Rating Scales (Variables 1-31)

Training appears to have been more important than class type on the classroom rating scale variables, although some results of training are conflicting. There were no class type effects for classroom rating variables in grade 3; in grade 2, small classes received higher ratings for suitable traffic patterns and for greater visibility (Table VI-5).

Training, however, had several effects on classroom rating variables (Table VI-2). In the second grade, trained teachers' classrooms functioned more smoothly. Trained teachers organized their classrooms for better visibility, used efficient routines, procedures, and transitions, and had needed materials ready. These teachers described their objectives more clearly than comparison teachers. Surprisingly, however, their students exhibited more avoidance behavior during seatwork. All significant training effects in the third grade were negative, an unexpected result. These teachers were rated lower for their pacing of lessons, had a less task-oriented focus, and gave explanations and presentations that were less clear than comparison teachers. Training for third grade teachers was condition-specific and training for second grade was general.

5. Findings from Observer Narrative Descriptions

As part of the observation protocol, observers kept narrative records of the classes they visited. The records provide useful contextual information about the ratings given and the effects observed. A preliminary review of all third-grade narratives and a random selection of second-grade narratives yields a wealth of information about the observed classes.

The lack of consistent results between second and third grades prompts the question of whether classroom processes and curricula between the two years are qualitatively different. For the most part, the classes appear to be fairly similar, especially in reading. The format of teacher-led small - group instructions in reading predominates in both grades and all class types. In math some differences are evident. Second grade training teachers used more manipulatives of various types in presenting content than did second grade comparison teachers or third grade teachers. Second grade classes spent more time working through problems and worksheets as a class and less time in independent seatwork than did third grade classes. One reason for this difference may have been teachers' attempts to accommodate the shorter attention spans of second graders; observers commented much more frequently on wiggling, chair-twisting, and other physical expressions of excess energy in the second-grade narratives.

More marked than the differences between second and third grades were the similarities between classes, both between and within grades. A reader given an unmarked narrative would be hard pressed to decide whether it was a regular or small class. Teachers apparently made few changes in curriculum, lesson format, or methods based on class size. It might be expected that smaller classes would have smaller reading groups, but this does not appear to have been the case. Teachers in larger classes often had at least one reading group of three or four (this was frequently the lowest reading group), and often met with three or four groups rather than with the one or two groups common in the small classes. In some small classes, teachers took advantage of the lower numbers by meeting with the class as one large reading group. Also, most larger classes had several students who left during reading, presumably for remediation, reducing so-called "regular" classes to the size of the small classes. This was especially common in the third grade. The presence of an aide made little difference in the numbers in groups, as the aide usually either monitored seatwork or accompanied students to resource classes rather than working with a separate reading group.

Within grades, math classes were also highly similar. Teachers presented or reviewed a concept by having students work problems at the board or at their desks; the class worked through a worksheet together, and problems were assigned to be completed individually (usually while reading groups met). Math lessons ended when it was time for lunch. Working in groups was extremely rare, regardless of class size; use of manipulatives was infrequent, especially in the third grade.

Teachers used aides in two distinct ways. About half of the aides did little other than clerical work. They monitored the class if the teacher was called out of the room, but otherwise they had only limited contact with students. Other aides were much more active with students, circulating while the teacher presented math content and during seatwork assignments and occasionally meeting with a reading group or with individual students during reading. One exception to the limited use of aides with reading groups occurred in one training classroom. Students in this classroom were divided into three reading groups. At any given time, one group worked with the aide, one group worked with the teacher, and one group worked on seatwork. Each group met with both the aide and the teacher. Thus, each student had one hour of direct reading instruction rather than the usual thirty minutes. This was the only observed classroom where the aide was used so fully.

Content and format of the third grade lessons was surprisingly consistent across classrooms. Teachers clearly kept closely to the prescribed curriculum. The shortcomings of the curriculum were clear. The focus in almost all classes was on task completion rather than on understanding concepts. Lessons consisted of unrelated pieces of information rather than units of meaning. This was especially evident in reading, where a typical lesson might include vocabulary drill, dictionary skills, phonics, and oral reading. Teachers occasionally related vocabulary words to reading; only very infrequently did teachers relate the phonics they had just been drilling to the stories students read. Very few teachers had students write anything more than the few words necessary to complete a worksheet. The isolation of the teaching of reading skills from reading itself is typified by the casual comment of one teacher to the observer that her class wasn't having reading today--they were going to the library instead!

A review of the narratives from math and reading classes reveals classes that are remarkably similar, regardless of training or class type. Teachers rarely waver from the curriculum they are given, which stresses skills in isolation from meaning.

6. Training and Student Achievement

In both second and third grades, classes with trained teachers had slightly higher scores in both reading and math than the classes with untrained teachers (see Table VI-II). In second grade, trained teachers in each class type had higher scores than untrained teachers. In third grade, the untrained teachers in small classes had higher mean scores than the trained teachers, but the trained teachers had higher class averages in the other two class types. While some of the second grade differences approached significance, overall training did not make a significant difference in student achievement in either second or third grade.

An important comparison is of differential growth in achievement of students in classes with trained teachers as compared to untrained teachers, because this adjusts for differences that may exist in the beginning test scores. In the second grade, trained and untrained teachers had very similar gain scores in both reading and math, and in the third grade, untrained teachers had slightly higher gain scores in both subjects, although the differences were not significant (see Table VI-12). Gains by class type and training exhibited inconsistent patterns between reading and math and between the second and third grades. The differences in the gain scores of trained and untrained teachers were small and nonsignificant. While there were some interactions between class type and training, they were inconsistent across subjects (reading and math) and second and third grades.

The overall conclusion is that training does not make a significant difference in student achievement, nor does it make a significant difference for any one class type. Training did not help the small class teachers to improve student achievement any more than it helped regular class teachers or teachers with an aide.

One hypothesis is that some teachers respond to training and make changes in their teaching styles or try new things, while others do not. The trainers rated the teachers at the end of their three-day training on a five-point scale on their attitude toward the training, their participation in the training, and their commitment to try some new things. Trainers gave teachers very positive ratings for attitude, positive for participation, but fairly neutral for commitment. These teacher ratings were correlated with student gains in reading and math. There was a positive correlation of about .4 between the trainers' ratings of the teachers' attitudes, participation and commitment and student achievement in reading. For math, the correlation was lower, .17 for attitude, .01 for participation, and .16 for commitment (second grade data). These positive correlations between attitude and commitment estimates and subsequent class performance suggest that teachers with good attitudes about teaching and who are willing to make commitments to try new things are likely to be effective teachers. Training, however, doesn't necessarily "cause" student achievement; and it may be that these qualities existed before the training.

Trainers also rated the teachers at the end of the follow-up period on the extent to which they had responded to the training. About 75 percent were rated as responsive, while 25 percent did not respond to training. This was a subjective rating, and some of the trainers gave their teachers more positive ratings than others, so there is a definite trainer effect on the ratings. The mean achievement level in classes where the teacher responded to the training was not significantly different from the mean class achievement level of the teachers who did not respond to the training. There was also no significant difference in their gain scores.

7. Discussion of the Observation Result

There are several possible reasons why the training provided to the second and third grade teachers did not lead to significant improvement in student average test scores or gains. The great majority of Project STAR teachers were experienced and about four-fifths of them had participated in other in-service training within the preceding three years. It is clearly not accurate to refer to the remainder of the STAR teachers as "untrained, " for most of them had some similar training. Therefore, in an experienced group of teachers the marginal effect of three days of additional training may not be large enough to affect student test scores.

Second, the training emphasized topics such as teaching higher order thinking skills and diagnosing students' learning needs. Even if the teachers benefitted from the training and were able to apply the skills that they were taught, this might not be reflected in the test results. Tests focused on "basics."

Third, many of the teachers were not highly motivated to participate in the training. In the exit interviews when the teachers were asked if the training program led them to change their teaching in any way, about half the teachers said that it did not. Of those who did say it helped them, several gave general answers such s "it made me more creative," "I tried some new things and they helped some. " A few made specific comments about how they had taught higher order thinking skills. When asked whether they thought the changes they had made in teaching would be reflected in their students' test scores, less than 10 percent said yes.

The interviews at the end of the year were in marked contrast to the very positive teacher ratings of the training at the time they completed it and the initial commitment that most of the teachers made to try something different. This suggests that training is not sufficiently reinforced, even when there are follow-up sessions with a skilled trainer, to get a majority of teachers to incorporate it into their classroom repertoire of skills and procedures. It may not be possible for even a highly skilled outside trainer to encourage experienced teachers to do something new unless the teachers are self-motivated to improve. In addition, the improvement effort needs to be strongly reinforced by the principal and/or local system supervisors. While a number of the principals had a positive attitude about the training program, most of them were uninvolved. To try to stimulate more school and system reinforcement for the training, Hilda Nason, who had developed the training package, visited all of the training school principals in the summer before the third- grade training. She discussed the objectives and methods of the training program with the principals and tried to involve them in reinforcing their teachers' improvement efforts. The evidence from the third grade results suggests that this strategy did not make a measurable difference in student achievement.

One limitation to the study of which the investigators were aware from the outset was the relatively small amount of observation time available. However, even with the limited observation time, there appears to be support for the effects of class size on teacher and student behavior in grade 2 but not grade 3. There are predictable differences in class processes that follow simply from the numbers: students are more visible; each student is more likely to get a turn more often during class lessons; students do not have to wait as long for help; students can initiate more contacts with teachers.

The unique feature of this study was the inclusion of training for a subsample of teachers and there are training effects particularly for practices related to classroom management (e.g., the efficiency of classroom routines, general procedures, transitions). Also, teachers in all types of classes appear to benefit equally from training, although this effect was not strong.

Statistical findings for differences in teacher behavior between class sizes and for trained and untrained teachers were not strong and formed no coherent pattern of effects. Several significant findings in grade 2 were contradicted in grade 3: variables with significant effects in grade 2 were not significant in grade 3 or, in some cases, actually showed opposite effects in grade 3.

The most important findings had to do with similarities rather than differences. Teachers of both grades and all class types spent much more time in reading than in math. Descriptive notes provide insights into how instruction occurs in these highly similar lessons. Teachers orchestrate a narrow, tightly controlled skills approach to the curriculum. There is very little variation from this model, indicating that the State Basic Skills First curriculum had the effect of making lesson content and format more uniform. While this study controlled for training, class size, follow-up, and feed back to teachers, it did not control for the nature of the curriculum, and it is clear from narrative descriptions that curriculum, especially in reading, exercised strong influence on the way teachers taught. The same lessons appeared repeatedly across classes and cross schools in both reading and math. Clearly these teachers were following the curriculum so closely that they were virtually in the same place in the book at the same time. This finding leads to a series of questions regarding what possible effects training or class size can be expected to have when the requirements of the curriculum clearly dominate the pacing and structure of classroom lessons.

Our data point up the importance of the curriculum to the type of learning we are encouraging in our schools. If the content we desire is a basal-driven, isolation of skills and memorization of facts as the core for second and third grade reading and math, then the strategies teachers have developed to cope with their curriculum are satisfactory. However, if instructional goals are to increase the development of higher-order thinking skills, creativity, and personal responsibility for learning, a reduced teacher/student ratio may be important to enable teachers to achieve these objectives effectively. Fewer rote tasks, more reading and writing in context, more problem-solving activities -- all will require more teacher/student interaction than the present curriculum. If such broad changes in learning outcomes are desired, changing class size and training teachers alone will not be enough; these changes must be coupled with a curriculum focused on these objectives.

Table VI-1

Teachers in Training, Comparison and Other Groups in Grades 2 and 3 by Class Types, Project STAR

Second Grade	**Trained**	**Comparison**	**Others**	**Total**
Small	23	13	97	133
Regular	14	10	76	100
Regular/Aide	17	9	81	107
Total	**54**	**32**	**254**	**340**

Third Grade	**Trained**	**Comparison**	**Others**	**Total**
Small	25	15	100	37
Regular	15	8	67	21
Regular/Aide	17	9	80	26
Total	**57**	**32**	**257**	**336**

Figure VI-1

Stanford Achievement Test

Third Grade Total Reading: Class Type by STAR Training

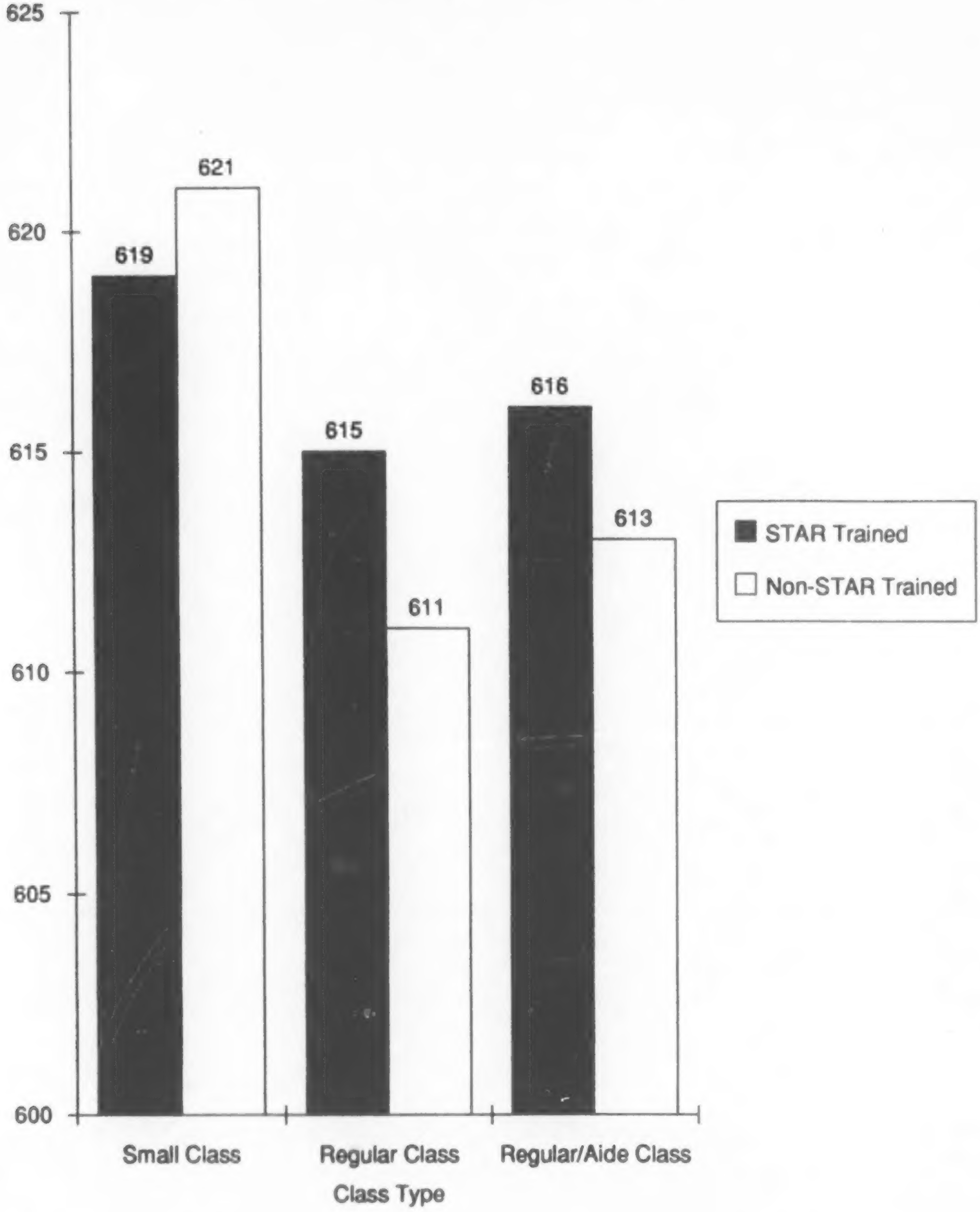

TABLE VI-2. Means and Standard Deviations for Grade 2 and Grade 3 Training Conditions Aggregated Across Class Type. Classroom Rating Variables

	GRADE 2-FALL ONLY						GRADE 3 - FALL ONLY					
VARIABLE	TRAINING (n=54)		COMPARISON (n=32)			Effect	TRAINING (n=53)		COMPARISON (n=31)			Effect
(Classroom Rating)	M	SD	M	SD	Sig.	Size	M	SD	M	SD	Sig.	Size
1. Suitable Traffic Patterns	4.57	.72	4.25	.76	.06	.43	3.92	.86	4.16	.78		
2. Good Visibility	4.54	.69	4.22	.79	.05	.40	3.79	.97	4.13	.76	.10	-.44
3. Describes Objectives Clearly	4.63	.71	4.22	.79	.01	.52	3.81	.93	4.03	.91		
							n=52					
4. Materials are Ready	4.69	.58	4.34	.75	.02	.46	4.04	.83	4.32	.83	.13	-.34
5. Clear Directions for Assignments	4.52	.77	4.50	.67			3.94	.86	4.23	.88	.16	-.32
6. Individualized Assignments	3.67	1.03	3.56	.87			2.89	1.29	2.96	1.15		
	n=46		n=25				n=38		n=26			
7. Provides, Seeks Rationales	4.11	.85	4.03	.65			3.40	1.12	3.77	1.15	.14	-.33
8. Appropriate Pacing of Lesson	4.52	.77	4.50	.76			3.68	1.05	4.13	.96	.05	-.47
9. Clear Explanations, Presentations	4.57	.77	4.48	.63			3.85	.93	4.29	.86	.03	-.51
			n=31									
10. Monitors Student Understanding	4.50	.82	4.34	.75			3.81	.96	4.13	.92		-.34
11. Enforces Work Standards	4.63	.65	4.47	.80			3.79	1.03	3.97	1.02		
12. Efficient Admin. Routines	4.55	.69	4.19	.88	.05	.42	3.85	.99	4.10	1.11		
	n=47		n=27									
13. Appropriate General Procedures	4.54	.82	4.13	.79	.02	.52	3.85	.89	4.10	.94		
14. Efficient Small Group Procedures	4.56	.79	4.41	.71			3.86	1.10	4.26	1.02	.13	-.39
							n=43		n=27			
15. Routines for Academic Work	4.53	.73	4.30	.75		.31	3.87	1.00	4.03	1.05		
	n=51		n=30									
16. Considers Attention Spans	4.24	.78	4.13	.94			3.60	.96	3.94	.85	.11	-.40
			n=30				n=52					
17. Successful Students	4.43	.67	4.30	.60			3.89	.85	4.16	.82	.15	-.33
	n=53		n=30									
18. Actions Related to Students' Interest	4.37	.65	4.10	.76	.09	.36	3.57	.95	3.90	.92	.12	-.36
			n=30						n=30			

19. Rewards Good Performance	4.46	.88	4.42	.99 n=31			3.74	1.02	4.10	1.08	.13	-.34
20. Consistent	4.47	.87 n=53	4.26	.86 n=31			3.94	.86	4.06	1.03		
21. Effective Monitoring	4.46	.86	4.26	.97 n=31			3.83	.99	3.90	1.19		
22. Efficient Transitions	4.48	.75	4.06	1.06 n=31	.04	.39	3.71	1.00 n=52	4.13	.99	.07	-.42
23. Disruptive Behavior	1.72	.91 n=53	1.71	1.05 n=28			1.75	.89 n=48	1.59	.89 n=27		
24. Stopped Quickly	4.24	1.15 n=33	4.48	1.12 n=21			4.00	1.13 n=42	4.35	1.09 n=20		
25. Ignored	2.69	1.51 n=29	1.93	1.38 n=14	.12	.55	1.79	1.08 n=29	2.45	1.29 n=11	.11	-.51
26. Inappropriate Behavior	1.75	.83 n=53	1.77	.96 n=31			1.82	.73 n=49	2.00	1.13 n=26		
27. Stopped Quickly	4.38	1.01 n=37	3.88	1.48 n=25	.12	.34	3.98	1.16 n=46	4.33	1.01 n=24		
28. Ignored	2.79	1.45 n=33	2.00	1.20 n=15	.07		2.06	1.22 n=33	2.36	1.29 n=11		
29. Task-Oriented Focus	4.70	.57	4.45	.72 n=31	.08	.35	3.77	1.03	4.32	.87	.01	-.63
30. Relaxed, Pleasant Atmosphere	4.44	.74	4.45	.89 n=31			3.81	1.14	4.29	1.01	.06	
31. Avoidance Behavior During Seatwork	2.70	1.53 n=53	2.06	1.18 n=31	.05	.54	2.61	1.31 n=51	2.93	1.47 n=27		

n's are indicated when missing cases > 10%.

TABLE VI-3. Means and Standard Deviations for Grade 2 and Grade 3 Training Conditions Aggregated Across Class Type. Reading Variables.

	GRADE 2-FALL ONLY						GRADE 3 - FALL ONLY					
VARIABLE	TRAINING (n=54)		COMPARISON (n=32)				TRAINING (n=53)		COMPARISON (n=31)			
(READING)	M	SD	M	SD	Sig.	Effect Size	M	SD	M	SD	Sig.	Effect Size
1. Av. Time in Subject (min.)	73.38	24.99	75.51	26.84			66.48	25.06	66.52	27.21		
2. No. of Small Groups	2.70	1.42	2.69	1.42			1.44	1.23	1.42	1.15		
3. Content Development	14.21	24.55	1.95	3.43	.01	3.57	10.71	15.10	13.58	17.81		
4. Assignment Directions	1.14	2.62	1.69	4.48			1.30	2.46	1.72	2.83		
5. Indep. Seatwork	1.65	3.94	2.01	4.02			10.30	15.46	7.21	12.31		
6. Small Group Instruction	36.77	25.73	50.39	15.03	.01	-.91	31.47	24.70	31.63	25.72		
7. Testing	1.04	7.68	1.15	6.49			.45	1.87	.58	2.25		
8. % Indiv. Contacts	69.96	27.97	67.54	35.94			68.74	34.30	75.87	35.06		
9. % Teacher Init. Contacts	62.21	24.87	60.14	34.48			53.19	24.00	61.31	30.04		
10. % Student Init. Contacts	8.31	7.75	7.36	8.03			15.55	18.76	14.56	13.47		
11. % T-Initiated Directives	19.23	13.93	27.55	30.74	.09	15.93	15.15	13.88	11.23			
12. % T-Initiated Questions	36.97	19.89	29.90	19.45	.11	.36	31.85	18.25	42.56	24.91	.03	-.43
13. % T-Initiated Comments	5.78	6.11	2.62	3.41	.01	.93	5.40	6.71	4.87	8.64		
14. % T-Initiated Ac. Contacts	49.93	22.96	51.80	31.31			42.82	22.03	49.97	27.84		
15. % T-Initiated Behav. Contacts	5.53	4.43	4.93	6.07			4.06	4.43	4.81	7.40		
16. % S-Initiated Questions	4.41	4.32	4.16	5.95			9.59	12.68	6.95	8.36		
17. % S-Initiated Comments	3.90	4.62	3.45	4.24			5.96	8.55	7.61	8.35		
18. % S-Initiated Ac. Contacts	5.75	5.66	5.78	6.42			10.02	12.18	10.62	8.99		
19. % S-Initiated Proc. Contacts	2.59	3.24	1.66	2.47	.17	.38	5.33	9.27	3.94	5.80		
20. #/hr. Contacts Praise *	1.23	2.32	.58	1.82	.18	.35	..	..	..	..		
21. #/hr. Contacts Criticism *	2.72	3.17	1.52	2.35	.07	.51	..	..	..	..		

VARIABLE	TRAINING (n=54)		COMPARISON (n=32)				TRAINING (n=53)		COMPARISON (n=31)			
(READING)	M	SD	M	SD	Sig.	Effect Size	M	SD	M	SD	Sig.	Effect Size
22. % Contacts T-Initiated	89.70	8.09	86.73	17.42			79.53	19.81	80.81	14.27		
23. % Contacts Academic	79.54	14.66	85.27	10.65	.06		78.64	18.84	80.90	16.57		
24. % Contacts Behav.	7.24	6.68	6.36	5.59			5.66	6.00	6.70	9.80		
25. % Contacts Directives	27.52	16.11	39.01	19.09	.004		23.12	18.80	18.96	14.78		
26. % Contacts Questions	58.96	19.08	50.35	20.92	.05		61.99	20.35	65.72	17.45		
27. % Contacts Praise *	1.88	3.52	.90	2.66	.18	.37	--	--	--	--		
28. % Contacts Criticism *	4.12	4.92	2.31	3.12	.07	.58	--	--	--	--		
29. % Time Spent in Academic Acts.	97.64	3.69	97.43	3.36			93.61	9.03	93.68	6.69		
30. % Students Def. On-Task	86.72	9.12	89.52	9.36			86.38	12.12	88.48	13.48		
31. % Students Prob. On-Task	4.30	3.32	3.22	2.53	.11	.43	5.91	7.54	3.39	4.69	.10	.54
32. % Students Off-Task	6.90	6.47	5.52	6.55			5.97	5.78	5.61	8.20		
33. % Students Waiting	1.78	2.92	1.70	2.72			2.19	4.55	2.05	4.04		

* Data for this variable not collected for Grade 3.

VI-4. Means and Standard Deviations for Grade 2 and Grade 3 Training Conditions Aggregated Across Class Type. Math Variables.

VARIABLE	GRADE 2-FALL ONLY						GRADE 3 - FALL ONLY					
	TRAINING (n=54)		COMPARISON (n=32)				TRAINING (n=53)		COMPARISON (n=31)			
(MAIN)	M	SD	M	SD	Sig.	Effect Size	M	SD	M	SD	Sig.	Effect Size
1. Av. Time in Subject (min.)	38.42	10.60	34.20	14.37			40.04	15.35	40.93	15.24		
2. No. of small groups	.30	1.33	.06	.35			.27	.53	.17	.38		
3. Content Development	37.86	17.05	29.86	20.05	.04	.40	32.24	16.64	30.95	14.53		
4. Assignment Directions	3.35	7.52	4.50	6.67			4.36	6.55	2.76	3.17		
5. Independent Seatwork	11.98	12.65	18.04	17.08	.06	-.36	14.97	15.20	17.20	13.77		
6. Small Group Inst.	.36	2.67	.52	2.07			.41	2.97	.54	2.95		
7. Testing	3.26	11.76	3.74	11.49			.96	3.29	.22	1.22		
8. % Indiv. Contacts	71.93	41.86	66.55	43.72			67.67	39.71	64.20	40.06		
9. % T-Initiated Contacts	63.25	38.33	55.48	39.32			55.64	31.43	52.10	30.24		
10. % S-Initiated Contacts	8.52	9.18	9.80	11.99			12.04	17.25	12.10	14.91		
11. % T-Initiated Directives	17.80	15.35	20.62	25.29			17.12	20.99	14.72	14.72		
12. % T-Initiated Questions	34.67	31.53	27.56	26.39			30.24	19.76	30.96	19.91		
13. % T-Initiated Comments	8.74	9.63	7.30	8.10			8.28	11.48	6.42	12.06		
14. % T-Initiated Ac. Contacts	46.90	32.24	44.98	34.05			42.82	25.16	40.83	23.63		
15. % T-Initiated Behav. Contacts	6.74	5.99	5.60	9.55			3.82	6.57	5.42	7.87		
16. % S-Initiated Ques.	5.99	7.06	6.29	8.74			9.21	15.03	8.54	10.76		
17. % S-Initiated Comments	2.68	3.44	3.18	6.02			2.82	3.56	4.22	6.42		
18. 1 S-Initiated Ac. Contacts	6.07	7.44	6.55	8.15			7.75	11.75	7.68	9.66		
19. % S-Initiated Proc. Contacts	2.55	3.27	3.24	5.52			4.29	7.81	4.41	6.62		
20. #/hr. Contacts Praise *	2.30	4.44	1.58	6.56			..	..	..	..		
21. #/hr. Contacts Criticism *	2.23	3.06	1.40	2.12			..	..	..	..		

VARIABLE	TRAINING (n=54)		COMPARISON (n=32)				TRAINING (n=53)		COMPARISON (n=31)			
(MATH)	M	SD	M	SD	Sig.	Effect Size	M	SD	M	SD	Sig.	Effect Size
22. % Contacts T-Initiated	82.21	24.02	80.20	22.20			84.43	18.23	85.32	14.92		
23. % Contacts Academic	70.90	23.64	79.04	17.90	.10	-.45	76.29	20.96	80.58	18.25		
24. % Contacts Behavioral	9.13	7.69	7.70	10.05			5.67	8.19	7.23	9.60		
25. % Contacts Directives	27.99	20.50	29.41	23.10			23.30	20.91	28.04	24.53		
26. % Contacts Questions	55.55	22.37	54.92	25.96			60.29	25.90	61.46	24.66		
27. % Contacts Praise *	3.84	6.84	2.91	9.74			--	--	--	--		
28. % Contacts Criticism *	3.81	5.83	2.83	4.50			--	--	--	--		
29. % Time Spent in Academic Acts.	98.53	4.06	96.50	8.31			95.01	9.02	94.06	11.20		
30. % Students Def. On-Task	87.25	9.99	87.04	12.37			85.22	15.44	88.31	15.57		
31. % Students Prob. On-Task	3.86	2.99	3.12	4.63			4.38	6.23	1.71	3.14	.03	.83
32. % Students Off-Task	4.80	7.05	4.55	7.50			6.62	9.19	5.55	9.59		
33. % Students Waiting	4.43	6.52	5.83	8.46			3.66	7.84	4.44	10.09		

* Data for this variable not collected for Grade 3.

TABLE VI-5. Means and Standard Deviations for Grade 2 and Grade 3 Class Types Aggregated Across Training Conditions. Classroom Rating Variables.

VARIABLE	GRADE 2							GRADE 3						
	SMALL (n=36)		REGULAR (n=24)		AIDE (n=26)		SIG.	SMALL (n=37)		REGULAR (n=21)		AIDE (n=26)		SIG.
(Classroom Rating)	M	SD	M	SD	M	SD		M	SD	M	SD	M	SD	
1. Suitable Traffic Patterns	4.69	.58	4.38	.71	4.19	.94	.03	4.11	.66	4.19	.93	3.73	.92	
2. Good Visibility	4.69	.58	4.21	.78	4.23	.82	.01	4.05	.85	4.00	.84	3.65	1.02	
3. Describes Obj. Clearly	4.47	.74	4.54	.88	4.42	.70		4.03	.90	3.95	.94	3.65	.94	
4. Materials Are Ready	4.53	.70	4.67	.56	4.50	.71		4.24	.76	4.10	.89	4.04	.92	
5. Clear Dir. for Assignments	4.44	.77	4.54	.72	4.58	.70		4.11	.84	4.19	.75	3.85	1.01	
6. Individualized Assignments	3.55	.91	3.90	.94	3.48	1.08		2.80	1.22	3.05	1.32	2.95	1.18	
	n=29		n=21		n=21			n=25		n=20		n=19		
7. Provides, Seeks Rationales	4.11	.82	4.22	.52	3.92	.89		3.76	1.26	3.[illegible]	.98	3.27	1.04	
8. Appropriate Pacing of Lesson	4.53	.84	4.46	.66	4.54	.76		3.92	.95	3.95	1.12	3.65	1.09	
9. Clear Exp., Presentations	4.61	.69	4.54	.72	4.44	.77		4.14	.89	4.10	.83	3.77	1.03	
10. Monitors Students Und.	4.50	.81	4.25	.94	4.53	.58		4.00	.94	4.10	.77	3.69	1.09	
11. Enforces Work Standards	4.64	.76	4.38	.77	4.65	.56		3.95	.94	4.05	1.02	3.58	1.10	
12. Efficient Admin. Routine	4.34	.81	4.45	.74	4.48	.79		4.08	.95	4.00	1.00	3.69	1.16	
	n=29		n=22		n=23									
13. Appropriate General Proc.	4.39	.90	4.42	.72	4.35	.85		4.08	.76	4.00	.84	3.69	1.12	
14. Efficient Small Group Proc.	4.50	.91	4.50	.66	4.50	.65		4.07	.98	4.17	1.04	3.82	1.26	
								n=30		n=18		n=22		
15. Routine for Academic Work	4.42	.83	4.39	.66	4.52	.71		3.97	1.01	4.00	.89	3.81	1.13	
16. Considers Attention Span	4.34	.84	4.09	.73	4.12	.91		3.81	.97	3.86	.91	3.48	.87	
17. Successful Students	4.40	.65	4.35	.65	4.40	.65		4.11	.77	4.05	.86	3.77	.91	
18. Actions Rel. to Studs.' Int.	4.23	.77	4.35	.65	4.27	.67		3.78	.98	3.75	.97	3.50	.91	
19. Rewards Good Performance	4.31	1.17	4.43	.79	4.65	.56		3.97	.96	3.81	1.08	3.77	1.18	
20. Consistent	4.47	.81	4.09	1.11	4.54	.65		4.08	.83	4.05	.92	3.81	1.06	
21. Effective Monitoring	4.39	.90	4.13	1.14	4.62	.57		3.95	.97	3.86	1.01	3.73	1.25	
22. Efficient Transitions	4.31	.98	4.43	.84	4.27	.83		3.92	.86	4.10	.94	3.60	1.22	

VARIABLE (Classroom Rating)	GRADE 2 SMALL (n=36) M	SD	REGULAR (n=24) M	SD	AIDE (n=26) M	SD	SIG.	GRADE 3 SMALL (n=37) M	SD	REGULAR (n=21) M	SD	AIDE (n=26) M	SD	SIG.
23. Disruptive Behavior	1.66	1.00	1.95	1.13	1.58	.65		1.73	1.01	1.78	.94	1.58	.65	
24. Stopped Quickly	4.59	.80	4.13	1.26	4.19	1.38		n=33 4.24	1.02	n=18 3.73	1.49	n=24 4.22	.88	
25. Ignored	n=22 2.17	1.38	n=16 3.00	1.53	n=16 2.25	1.60		n=29 1.76	1.25	n=15 2.50	1.35	n=18 1.85	.80	
26. Inappropriate Behavior	n=18 1.58	.77	n=13 2.04	1.11	n=12 1.76	.72		n=17 1.67	.82	n=10 1.94	1.00	n=13 2.13	.85	
27. Stopped Quickly	4.46	1.06	3.95	1.31	4.05	1.35		n=33 4.19	1.14	n=18 4.00	1.28	n=24 4.05	.97	
28. Ignored	n=24 2.20	1.28	n=19 3.07	1.44	n=19 2.50	1.51		n=31 2.00	1.33	n=18 2.40	1.51	n=21 2.13	.96	
29. Task-Oriented Focus	n=20 4.56	.73	n=14 4.61	.66	n=14 4.69	.47		n=18 4.05	1.00	n=10 4.05	1.02	n=16 3.81	1.02	
30. Relaxed Pleasant Atmos.	4.44	.88	4.52	.67	4.38	.80		4.03	1.09	4.19	1.17	3.76	1.11	
31. Avoidance Behav. Dur. Seat.	2.31	1.45	2.61	1.44	2.56	1.45		2.60	1.52	2.72	1.32	2.88	1.20	

n's are indicated when missing cases > 10%.

TABLE VI-6. Means and Standard Deviations for Grade 2 and Grade 3 Class Types Aggregated Across Training Conditions. Reading Variables

VARIABLE	GRADE 2							GRADE 3						
	SMALL (n=36)		REGULAR (n=24)		AIDE (n=26)		SIG.	SMALL (n=37)		REGULAR (n=21)		AIDE (n=26)		SIG.
(READING)	M	SD	M	SD	M	SD		M	SD	M	SD	M	SD	
1. Avg. Time in Subject	70.63	22.00	77.08	27.22	76.38	28.82		64.22	24.59	72.47	28.42	65.27	25.59	
2. No. of Small Groups	2.69	1.69	2.54	.83	2.85	1.46		1.56	1.18	1.21	1.18	1.42	1.24	
3. Content Development	10.73	21.10	10.15	21.32	7.68	19.12		11.47	16.26	13.74	14.40	10.87	17.61	
4. Assignment Directions	.72	1.90	1.63	4.14	1.94	4.23		1.18	2.29	1.64	2.51	1.72	3.08	
5. Independent Seatwork	2.57	5.32	1.34	2.97	1.10	1.92		11.46	17.77	9.10	10.66	5.89	10.72	
6. Small Group Instruction	40.53	23.09	41.33	25.17	44.11	22.25		32.18	25.90	25.34	24.22	35.16	24.18	
7. Testing	.00	.00	.00	.00	3.58	12.96		.51	2.13	.74	2.30	.32	1.65	
8. % Individual Contacts	66.58	30.42	68.38	29.06	73.11	34.14		73.24	35.58	72.24	38.69	68.44	30.92	
9. % T-Init. Contacts	57.66	26.84	61.43	25.77	66.67	33.48		56.96	26.95	59.50	30.57	53.03	23.34	
10. % S-Init. Contacts	8.94	8.66	8.19	7.37	6.39	7.01		16.28	18.45	12.74	16.87	15.40	14.83	
11. % S-Init. Directives	18.69	13.35	22.45	15.32	27.23	33.60		16.05	14.41	13.49	14.67	15.11	12.46	
12. % T-Init. Questions	33.21	20.53	33.95	17.71	36.26	21.53		34.70	21.56	40.62	24.07	34.27	19.89	
13. % T-Init. Comments	5.60	6.44	5.20	5.58	2.67	3.06	.09	6.21	9.74	5.39	5.70	3.66	4.23	
14. % T-Init. Academic Contacts	47.37	24.73	50.54	22.90	55.20	30.99		46.51	24.32	47.93	28.43	42.49	22.27	
15. % T-Init. Behav. Contacts	4.98	4.45	6.04	5.82	5.07	5.28		4.66	6.06	4.43	7.31	3.86	3.80	
16. % S-Init. Questions	5.16	5.34	4.11	5.63	3.33	3.53		9.38	12.76	6.51	8.15	8.99	11.15	
17. % S-Init. Comments	3.75	4.75	4.41	4.49	3.09	4.08		6.91	8.59	6.23	10.30	6.41	7.00	
18. % S-Init. Ac. Contacts	6.16	6.19	6.16	6.00	4.84	5.58		10.39	10.54	8.47	11.73	11.35	11.39	
19. % Student-Init. Proc. Cont.	2.62	3.69	2.51	2.59	1.46	2.09		5.89	9.93	4.27	8.02	3.66	4.73	
20. #/hr. Contacts Praise*	1.31	2.74	.86	1.69	.66	1.56		--	--	--	--	--	--	
21. #/hr. Contacts Criticism*	1.85	2.52	2.66	3.23	2.51	3.22		--	--	--	--	--	--	
22. % Contacts T-Init.	88.20	9.46	89.37	7.93	88.43	18.39		78.82	18.38	85.21	14.74	77.89	18.93	

VARIABLE (READING)	GRADE 2							GRADE 3						
	SMALL(n=36)		REGULAR (n=24)		AIDE (n=26)		SIG.	SMALL (n=37)		REGULAR (n=21)		AIDE (n=26)		SIG.
		M	SD	M	SD	M	SD		M	SD	M	SD	M	SD
23. % Contacts Academic	80.96	13.73	82.60	11.68	81.79	15.21		80.48	16.82	80.80	18.87	77.20	19.20	
24. % Contacts Behavioral	7.47	6.07	7.82	6.93	5.30	5.87		6.06	7.78	6.58	10.09	5.67	5.31	
25. % Contacts Directives	29.71	18.17	32.91	13.12	33.66	21.83		22.69	18.41	18.17	16.29	22.37	17.07	
26. % Contacts Questions	56.18	19.51	52.99	16.71	57.73	23.92		61.23	19.65	68.08	20.36	63.04	18.03	
27. % Contacts Praise *	2.13	4.10	1.23	2.52	.92	2.33		--	--	--	--	--	--	
28. % Contacts Criticism *	3.34	4.56	3.74	4.39	3.33	4.36		--	--	--	--	--	--	
29. % Time in Acad. Activities	97.27	4.24	98.13	3.16	97.46	2.84		95.63	5.29	89.64	11.56	93.81	7.75	.03
30. % Students Def. On-Task	88.78	7.87	83.50	10.62	90.29	8.67	.02	88.36	11.92	88.21	9.37	84.82	15.45	
31. % Students Prob. On-Task	3.92	3.10	5.25	3.47	2.62	2.05	.01	5.46	7.67	3.32	3.49	5.42	7.00	
32. % Students Off-Task	5.33	5.52	8.40	6.69	5.99	7.35		4.97	6.80	6.00	6.66	6.90	6.88	
33. % Students Waiting	1.58	2.16	2.80	3.86	1.02	2.31	.07	1.84	4.66	1.70	2.28	2.86	5.03	

* Data for this variable not collected for Grade 3.

TABLE VI-7. Means and Standard Deviations for Grade 2 and Grade 3 Class Types Aggregated Across Training Conditions. Math Variables

VARIABLE	GRADE 2							GRADE 3						
	SMALL		REGULAR		AIDE		SIG.	SMALL		REGULAR		AIDE		SIG.
(MATH)	M	SD	M	SD	M	SD		M	SD	M	SD	M	SD	
1. Avg. Time in Subject	30.97	13.84	30.15	11.85	32.72	9.23		40.65	15.09	36.32	17.59	42.92	9.22	
2. No. of Small Groups	.22	.96	.08	.41	.31	1.57		.24	.49	.11	.32	.31	.55	
3. Content Development	33.38	17.63	33.51	18.02	35.80	20.84		30.94	13.97	34.76	17.26	30.77	17.50	
4. Assignment Directions	3.57	6.62	3.47	5.61	4.34	9.23		3.52	5.31	4.50	5.49	3.62	6.19	
5. Independent Seatwork	15.72	15.66	12.32	11.83	13.96	15.85		16.57	15.03	13.77	15.79	16.15	13.64	
6. Small Group Instruction	1.00	3.73	.00	.00	.00	.00		.44	2.66	1.13	4.92	.00	.00	
7. Testing	2.71	10.87	4.81	12.13	3.17	12.40		1.07	3.55	.00	.00	.66	2.35	
8. % Individual Contacts	69.12	42.92	66.48	36.30	74.22	47.80		68.85	44.40	70.21	37.08	60.14	34.61	
9. % T-Init. Contacts	59.30	39.95	56.57	30.60	65.32	44.09		52.44	30.63	63.36	34.18	50.46	28.47	
10. % S-Init. Contacts	9.76	10.50	8.21	9.54	8.66	10.89		16.40	27.71	6.85	6.71	9.68	9.97	
11. % S-Init. Directives	15.85	14.49	18.35	14.08	23.47	28.05		15.13	13.84	12.73	16.64	20.37	25.50	
12. % T-Init. Questions	30.88	33.61	28.94	23.12	36.47	30.13		27.31	18.61	45.48	19.09	24.10	16.37	.0004
13. % T-Init. Comments	9.51	9.80	9.31	10.81	5.39	5.11		10.00	15.65	5.15	6.45	5.98	6.48	
14. % T-Init. Academic Contacts	44.33	33.12	43.04	26.49	51.67	37.65		41.41	23.81	53.50	27.95	34.72	20.19	.04
15. % T-Init. Behav. Contacts	5.82	8.16	7.86	7.85	5.58	6.09		4.91	8.07	3.52	5.95	4.34	6.44	
16. % S-Init. Questions	6.46	5.83	5.19	8.94	6.46	8.84		12.36	18.32	5.07	5.10	6.98	7.80	
17. % S-Init. Comments	3.16	5.82	3.04	3.01	2.30	3.74		4.04	6.37	1.79	2.53	2.70	4.31	
18. % S-Init. Ac. Contacts	7.02	7.86	4.78	5.34	6.53	9.17		10.54	14.62	5.44	5.71	5.39	6.11	
19. % Student-Init. Proc. Cont.	2.73	4.25	3.43	4.84	2.32	3.66		5.86	9.51	1.42	2.38	4.29	5.56	.10
20. #/hr. Contacts Praise *	1.43	3.10	3.93	8.84	1.13	2.30		..	..	..	..	..	..	
21. #/hr. Contacts Criticism *	2.06	2.82	1.73	2.28	1.89	3.17		..	..	..	..	..	..	
22. % Contacts T-Init.	77.70	25.89	87.94	13.24	80.69	26.01		80.00	21.72	90.99	9.06	86.97	11.43	.05

VARIABLE (MATH)	GRADE 2 SMALL M	SD	REGULAR M	SD	AIDE M	SD	SIG.	GRADE 3 SMALL M	SD	REGULAR M	SD	AIDE M	SD	SIG.
23. % Contacts Academic	71.48	25.02	74.05	18.38	77.19	20.70		78.95	21.57	86.61	11.90	69.92	19.98	.02
24. % Contacts Behavioral	7.77	9.28	11.38	8.30	7.17	7.60		6.13	9.14	3.73	5.00	8.23	9.92	
25. % Contacts Directives	27.28	22.73	30.01	17.27	28.85	23.49		25.29	20.09	16.95	18.21	30.57	26.56	
26. % Contacts Questions	55.18	24.89	50.64	19.81	59.82	25.03		57.09	24.00	75.38	20.32	55.17	27.08	.01
27. % Contacts Praise *	2.62	5.48	6.15	12.22	2.26	5.37		--	--	--	--	--	--	
28. % Contacts Criticism *	3.86	5.71	3.53	5.13	2.80	5.23		--	--	--	--	--	--	
29. % Time in Academ. Acts.	97.28	5.97	96.99	8.41	99.18	2.45		95.56	7.73	93.69	14.28	94.08	8.78	
30. % Students Def. On-Task	88.76	10.55	83.99	11.46	87.91	10.52		88.44	13.68	83.75	19.22	85.27	15.05	
31. % Students Prob. On-Task	3.62	4.80	3.80	2.50	3.33	2.78		4.07	7.22	2.74	3.05	2.94	3.60	
32. % Students Off-Task	4.29	7.13	4.93	5.77	5.08	8.54		5.95	9.38	7.39	12.06	5.76	6.89	
33. % Students Waiting	3.43	5.83	7.33	9.06	4.86	6.96		1.57	3.92	6.11	12.40	5.74	9.79	.08

* Data for this variable not collected for Grade 3.

TABLE VI-8. Means and Standard Deviations for Classroom Rating, Reading and Math Variables Disaggregated by Training Condition and Class Type Variables with Significant Interactions (p < .10) Only

VARIABLE	SMALL				REGULAR				AIDE			
	n=23		n=13		n=14		n=10		n=17		n=9	
	Training		Comparison		Training		Comparison		Training		Comparison	
Classroom Rating Grade 2	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
None												
Classroom Rating Grade 3												
17. Students Successful in Lessons	4.00	.74	4.29	.83	4.15	.80	3.88	.99	3.53	.94	4.22	.67
19. Rewards Good Performance	3.87	.97	4.14	.95	3.62	1.12	4.13	.99	3.65	1.06	4.00	1.41
Reading Grade 2												
11. % T-Init. Directives	18.14	14.17	19.68	12.25	21.25	16.17	24.13	14.72	19.04	12.20	42.71	53.08
25. % Contacts Directives	26.69	17.56	35.04	18.69	31.10	14.97	35.43	10.21	25.68	15.42	48.73	24.98
31. % Students Prob. On-Task*	3.97	3.40	3.83	2.62	6.65	3.30	3.29	2.79	2.82	2.10	2.24	2.01
33. % S Waiting*	1.58	2.11	1.58	2.34	3.72	4.50	1.51	2.40	.47	.70	2.06	3.71
Reading Grade 3												
7. Testing	.40	1.85	.69	2.57	1.27	2.96	.00	.00	.00	.00	.93	2.80
12. % T-Init. Questions	28.47	16.92	44.49	24.89	43.14	18.28	37.16	31.45	28.92	17.96	44.37	20.38
17. % S-Init. Comments	6.22	8.41	7.98	9.07	7.65	12.61	4.28	5.99	4.52	5.12	9.98	8.88
25. % Contacts Directives *	26.43	19.10	16.82	16.18	12.46	14.58	26.02	16.03	25.75	19.22	16.00	10.06
26. % Contacts Questions	57.72	19.63	66.76	19.06	72.81	20.60	61.57	19.39	60.53	19.73	67.80	14.08
29. % Time in Ac. Activities	95.46	8.20	95.74	7.18	95.81	12.13	90.06	17.83	93.82	7.97	94.57	10.64
Math Grade 2												
16. % S-Init. Questions	6.08	5.84	7.13	5.98	3.49	5.46	7.56	12.27	7.93	9.18	3.67	7.90
19. % S-Init. Proc. Contacts*	1.75	2.02	4.47	6.33	2.64	3.76	4.54	6.09	3.56	4.03	.00	.00
23. % Contacts Academic	67.70	27.15	78.17	19.96	76.21	19.53	71.04	17.17	70.85	22.09	89.18	10.76
28. % Contacts Criticism	4.76	6.50	2.25	3.66	2.56	4.06	4.90	6.32	3.55	6.20	1.37	2.25
Math Grade 3												
6. Small Group Instruction	.00	.00	1.15	4.32	1.79	6.19	.00	.00	.00	.00	.00	.00

* p < .05

TABLE VI-9. Summary of Training Effects, Class Type Effects, and Interaction Effects For All Classroom Rating Variables

	Training Effect		Class Type Effect		Interaction Effect	
	G2	G3	G2	G3	G2	G3
1. Suitable Traffic Patterns	.05		Sml>Aide*			
2. Good Visibility	.05	.10	Sml>Reg* Sml>Aide*			
3. Describes Objectives Clearly	.01					
4. Materials are Ready	.02					
5. Clear Directions for Assignments						
6. Individualized Assignments						
7. Provides, Seeks Rationales						
8. Appropriate Pacing of Lesson		.05				
9. Clear Explanations, Presentations	.03					
10. Monitors Student Understanding						
11. Enforces Work Standards						
12. Efficient Administrative Routines	.05					
13. Appropriate General Procedures	.02					
14. Efficient Small Group Procedures						
15. Routines for Academic Work						
16. Considers Attention Spans						
17. Successful Students					.06	
18. Actions Related to Students' Interest	.09					
19. Rewards Good Performance						.06
20. Consistent						
21. Effective Monitoring						

22. Efficient Transitions	.04	.07
23. Disruptive Behavior		
24. Stopped Quickly		
25. Ignored		
26. Inappropriate Behavior		
27. Stopped Quickly		
28. Ignored	.07	
29. Task-Oriented Focus	.08	.01
30. Relaxed, Pleasant Atmosphere		.06
31. Avoidance Behavior During Seatwork	.05	

TABLE VI-10. Summary of Training Effects, Class Type Effects, and Interaction Effects For All Reading and Math Variables

*p < .05

	Training Effects				Class Type Effects				Interaction Effects			
	Reading		Math		Reading		Math		Reading		Math	
	G2	G3	G2	G3	G2	G3	G2	G3	G2	G3	G2	G3
1. Average Time in Subject												
2. N. of Small Groups												
3. Content Development	.006		.04									
4. Assignment Directions												
5. Independent Seatwork			.06									
6. Small Group Instruction	.008											.10
7. Testing										.09		
8. % Individual Contacts												
9. % Teacher-Initiated Contacts												
10. % Student-Initiated Contacts												
11. % Teacher-Initiated Directives	.09									.10		
12. % Teacher-Initiated Questions		.03						Sml<Reg*** Aide<Reg***		.08		
13. % Teacher-Initiated Comments	.009				Aide<Reg Aide<Sml							
14. % Teacher-Initiated Academic Contacts								Sml<Reg* Aide<Reg*				
15. % Teacher-Initiated Behav. Contacts												
16. % Student-Initiated Questions											.07	
17. % Student-Initiated Comments										.10		
18. % Student-Initiated Academic Contacts												
19. % Student-Initiated Procedural Cont.								Sml>Reg			.03	
20. #/hr. Contacts Res. in Praise												

21. #/hr. Contacts Res. in Criticism								
22. % Contacts Teacher-Initiated					Sml<Reg*			
23. % Contacts Academic	.06	.10			Aide<Reg*			.07
24. % Contacts Behavioral								
25. % Contacts Directives	.004					.07	.02	
26. % Contacts Questions	.05				Sml<Reg** Aide<Reg**		.08	
27. % Contacts Res. in Praise								
28. % Contacts Res. in Criticism	.07							.10
29. % Time in Acad. Activities				Sml>Reg* Aide>Reg*			.10	
30. % Students Definitely On-Task				Sml>Reg* Aide>Reg*				
31. % Students Probably On-Task		.10	.03	Aide<Reg** Sml<Reg**			.06	
32. % Students Off-Task								
33. % Students Waiting				Aide<Reg Sml<Reg	Sml<Reg	.02		

*p<.05
**p<.01
***p<.001

Table VI-11

Mean Stanford Achievement Test Scale Scores, for Trained and Untrained Teachers, by Class Type, Second and Third Grades.

Test and Training		**Class Type**		
Reading	**Small**	**Regular**	**Regular/Aide**	**Total**
Second Grade				
Trained	595.6	585.2	591.4	591.2
Not Trained	593.9	583.9	585.3	587.5
Math				
Trained	593.5	586.5	582.3	587.1
Not Trained	590.2	580.5	580.8	583.5
Third Grade				
Reading	**Small**	**Regular**	**Regular/Aide**	**Total**
Trained				
Not Trained	621.3	611.4	612.7	614.9
Math				
Trained	622.2	617.1	617.7	619.0
Not Trained	622.8	615.1	615.6	617.6

Teachers with out-of-range classes are excluded. The total included is 303 in third grade, and 308 in second grade.

Table VI-12

Mean Stanford Achievement Test Gain Scores, Reading and Math for Trained and Untrained Teachers, by Class Type, Second and Third Grades.

Test and Training	Class Type			
Second Grade				
Reading	**Small**	**Regular**	**Regular/Aide**	**Total**
Trained	53.1	59.1	63.6	58.6
Untrained	57.9	58.0	58.6	58.2
Math				
Trained	47.3	47.2	45.2	46.5
Untrained	44.6	43.5	47.3	45.3
Third Grade				
Reading	**Small**	**Regular**	**Regular/Aide**	**Total**
Trained	23.8	30.2	24.3	25.7
Untrained	27.4	27.5	27.4	27.4
Math				
Trained	28.7	30.6	35.4	31.9
Untrained	32.6	34.6	34.8	34.1

Teachers with out-of-range classes are excluded from the analysis.

VII. Effects of Class Size on Classroom Processes and Teacher Behaviors

It is becoming increasingly clear that significant reduction of class size (13-17 students) in kindergarten through third grade results in increased student achievement as measured by standardized reading and math achievement tests (Achilles, Bain, Folger, Johnston, & Lintz, 1987, 1988; Finn, Achilles, Bain, Folger, Johnston, Lintz , & Word, 1989; Word, Bain, Folger, Johnston, & Lintz, 1989). Exactly how teaching and learning changes in K-3 classrooms with fewer students is less clear. Relatively little is known about how overall classroom life for teachers and children in small size classes differs from that in regular size classes of about 25 students.

The contemporary policy debate about optimal class size often neglects consideration of how classroom life changes when class size is reduced or when student/teacher ratio is reduced by use of full-time teacher aides. Reviewing 22 studies of class size and teaching practices, Robinson and Wittebols (1986) conclude that smaller classes tend to promote the use of more desirable teacher practices, noting correctly, however, that smaller classes do not guarantee that teachers will take advantage of having fewer students and modify their teaching practices. Teachers in small size classes were found to use more desirable classroom practices such as more attention to individual children and more individualization of instruction.

In a review of nine studies using direct classroom observations to measure teaching practices in larger and smaller classes, Robinson and Wittebols (1986) report that six studies found no significant difference in teaching practices and that three studies found teachers in smaller classes using more desirable practices. Cahen, Filby, McCutcheon, and Kyle (1983), in a qualitative study of changes in instructional processes in teacher and student behavior in small classes, also observed positive changes in teaching practices. Johnston and Davis (1989) analyzed interviews with teachers who had taught in small size classes and reported positive changes in several dimensions of quality of life for teachers and children in small classes. Johnston's (1990) analysis of a large number of teacher interviews found that K-3 small class size teachers reported engaging in teaching practices that were more developmentally appropriate and congruent with knowledge of child development (Bredekamp, 1987).

Project STAR results make an important contribution to the knowledge base about the effects of reduced class size and reduced student/teacher ratio on classroom processes and teacher behaviors. Throughout the four years of the project, data were collected regarding K-3 teacher grouping practices, parent/volunteer-teacher interaction, teachers' perceptions of their work-related problems, and teachers' perceptions of changes resulting from reduced class size or the addition of a full-time aide.

A. Teacher Exit Interview

1. Data Source and Procedures

Project STAR kindergarten through third grade teachers assigned to small size classes, regular size classes, and regular size classes with a full-time aide were interviewed by consortium staff at the end of each school year from 1986 through 1989. The broad purpose of these exit interviews was to identify and describe those aspects of classroom teaching that teachers experienced differently in comparison to the previous year's experience in a regular size class. The results of these interviews provide insights regarding why small size classes outperformed regular size classes on norm and criterion-referenced, standardized measures of reading and math achievement.

The annual Teacher Exit Interviews are the primary data source for this section. Interviews were conducted by representatives of the university consortium in May 1986, 1987, 1988, and 1989 with small class teachers (128 kindergarten teachers, 126 first grade, 86 second grade, and 88 third grade teachers); with regular class teacher (101 kindergarten, 113 first grade, 54 second grade teachers, and 55 third grade teachers); and with regular/aide teachers (99 kindergarten, 107 first grade, 71 second grade, and 70 third grade teachers). In sum, over a four-year period, 1,003 kindergarten, first, second, and third grade teachers participated in related structured, year-end interviews.

a. Kindergarten teacher interview procedures.

The primary question explored indepth with each Project STAR kindergarten teacher was: If your experience was different this year than last year, then how was it different? A three stage iterative analysis was performed on the first year (kindergarten) data. In the first stage, teachers' inter-view response statements were examined to identify and define common themes. In the second stage, interview statements were categorized along the dimensions of those themes. In the third stage a random set of responses, which had been set aside at the outset of the analysis, was used to check the reliability of the theme categories and the coding process. Examination of the 328 kindergarten teacher interviews revealed 17 distinct categories. Three categories addressed project procedures and student characteristics and are not addressed in this report. Fourteen categories were identified to address teachers' perceptions of teaching either in a small class, a regular class with no aide, or in a regular class with a full-time aide. Each category is described below.

Grouping of students - Describes classroom grouping practices and groups. Refers to number of groups, purpose of groups, forming groups, determining group membership, flexibility of group membership over time, use of aides related to groups.

Physical environment - Describes features of the classroom physical environment. Refers to amount and use of classroom space, furniture arrangement, heat, light, noise level, and traffic patterns.

Learning centers - Refers to the presence of, setting up, provisioning, managing, using, perceived effects of, and quality of learning centers in the classroom. Includes references to use of aides related to learning centers.

Social climate - Refers to social interactions among children and between teacher and child. Includes references to cooperation between children, and teacher knowledge of individual children's strengths and weaknesses, both personal and academic.

Enrichment Activities - Refers to those experiences and people that provide student learning opportunities other than the usual classroom instructional activities; examples include: cooking activities, special art, music or drama, field trips, and invited guests in the classroom. Includes references to planning and carrying out enrichment activities and the use of the aide with enrichment activities.

Classroom management - Refers to student problem behavior, and includes statements indicating the frequency of problem behavior, the bothersomeness of such behavior, and techniques to prevent and deal with problem behavior.

Monitoring and evaluating student progress - Refers to monitoring student progress, appraising student progress, and giving students feedback about their progress.

Morale and attitude toward work as a teacher - Refers to having a positive outlook, being or not being tired, level of frustration and stress, degree of satisfaction, physical health and well-being, and mental health and well-being.

Amount or rate of student progress - Refers to amount of material covered and how quickly students grasped the material. Includes references to the aide relative to amount or rate of material covered.

Parent-teacher relationships - Refers to how parents are used, problems with using parents in the class, parent-teacher communication, and home-environmental factors.

Teacher Aides - Includes responses about having or not having an aide, quality of the aide, use of aide or aide duties, and aide characteristics.

Instruction - Includes references to instructional time, purposes, curriculum, instructional goals, teaching methods and techniques, and degree of structure.

Teacher planning and preparation - Refers to planning class activities, preparation of teaching materials or the instructional environment. Includes references to paper-work, copying, duplicating, stapling, record keeping, collecting money, etc.

Individual attention to students - Refers to one-on-one attention or instruction to children. Includes references to reteaching and reinforcement of content as well as student counseling.

b. First Through Third Grade Teacher Interview Procedures

The second year (first grade) interview schedule included the fourteen themes identified from the kindergarten interviews. All first grade teachers were also asked to identify any additional differences not covered in the 14 areas; however, no further differences emerged.

The third year (second grade) interview schedule was developed from significant themes that emerged from the previous two years and from variables identified from research literature on instruction. The 1988 second grade Teacher Exit Interview questions asked teachers to describe differences, if any, that they perceived regarding the following dimensions: (a) amount of content covered, (b) amount of instructional time on task, (c) monitoring children's work, (d) ability to match level of instruction to the ability of individual students, (e) pacing of instruction, (f) degree of active student-teacher academic interaction, (g) individual attention to children, (h) classroom social climate, (i) demands on available teacher time, and (j) use of full-time teacher aide. These ten dimensions emerged from 1986 exit interviews with teachers (Achilles, et al., 1987), 1987 exit interviews with Project STAR first grade teachers (Johnston, 1988), and instruction research literature. The fourth year (third grade) interview schedule contained a combination of all unique dimensions identified and employed in the earlier kindergarten through second grade interview schedules.

2. An Overview of Project STAR K-3 Teacher Exit Interview Responses

Small, regular, and regular/aide teachers' perceptions of how their experiences differed were highly consistent from grade level to grade level. With few exceptions, the differences reported by K-3 small and regular/aide class teachers were essentially similar. Interview responses from these two groups differed only in their explanations of the reasons for the differences they described. Small class teachers explained how their teaching had differed in relation to having only 13-17 children, whereas regular/aide class teachers explained how having a full-time teacher's aide accounted for the differences they experienced.

The following sections of this chapter present only a summary report of the more detailed kindergarten, first, second, and third grade Project STAR Teacher Exit Interviews. More detailed presentations of the Project STAR teacher interviews are available in other reports (Achilles, et al., 1987; Johnston, 1989a, 1989b).

a. A Summary of Regular Size Class Teacher Perceptions

Regular class Project STAR teachers were interviewed each year along with small and regular/aide class teachers. The purpose of the kindergarten through third grade regular class teacher interviews was to monitor the effect of participation in Project STAR on the normal course of schooling in each project school and grade level. Most K-3 regular class teachers reported that there had been no difference between their teaching experience during the project year and the previous year of teaching. The differences that were described by the K-3 regular class teachers focused primarily on differences in their work setting and requirements that resulted from their school system's participation in Project STAR.

Random assignment of both children and teachers to small, regular, and regular/aide classes was a strong feature of the Project STAR research design. However, for many schools this design feature mandated changes in traditional patterns and practices of grouping children in classes within a grade level. The result of randomly assigning children to classes meant that many kindergarten through third grade teachers who had been accustomed to teaching homogeneous ability grouped classes were now faced with teaching classes that were a heterogeneous mix of low, average, and high ability students. Some teachers, who for years had been teaching classes composed only of high achieving children, now had to change their teaching practices to accommodate classes containing middle and low achieving children as well. In some instances, Project STAR's random assignment procedures also caused these teachers, for the first time, to teach classes which contained low achieving Chapter I students. Also, for some regular class teachers, their school's participation in Project STAR meant slightly smaller classes than the 25-27 children they normally would have had.

b. An Introduction to Small and Regular/aide Class Teacher Perceptions

Small and regular/aide class K-3 teacher exit interviews (1986-89) provide useful insights into two related and fundamental aspects of life in primary grades: the process of instruction and the classroom learning environment. When teachers were asked how their experience teaching a small or a regular/aide class differed from their experience teaching a regular class, they talked about instructional time in relation to rate of student progress, instructional pacing, instructional time on task, and demands on the teacher's available time. They talked about instructional processes and strategies in relation to planning, grouping, monitoring student work, individualizing instruction, and using learning centers and enrichment activities.

These teachers also described fundamental differences between the overall classroom work environment in small and regular/aide versus regular classes. They spoke about the classroom's physical environment, interpersonal relations within the class, parent relations, classroom management, and their own morale as teachers.

K-3 small and regular/aide class teachers described two salient differences between their experience of instructing children in small or regular/aide classes and their experience teaching in regular classes: availability and use of time, and opportunity to individualize instruction.

3. Time and Instruction

Time was a dominant theme observed throughout small and regular/aide class teacher interview responses. The amount and pace of academic content covered was the most pervasive time difference noted by kindergarten through third grade teachers. Most small and regular/aide class teachers reported covering required content faster and covering more content than they had been able to do with a regular class. Teachers reported, for example, covering more required objectives or completing all grade-level reading and math texts. Many explained that they had gone into more depth than ever before. They reported learning that their daily schedule could be more relaxed and that they would still complete necessary work. This meant, for example, that they could pause to look things up in the dictionary or encyclopedia or that they could spend more time discussing a topic with more children having an opportunity to participate.

a. Variety and appropriateness of learning opportunities.

Small and regular/aide class teachers discovered early in the school year that necessary basic instruction required less time, making more time available for other uses. Some teachers used this time to provide a greater variety of learning opportunities for their students. For example, teachers described using more manipulative materials and first-hand learning activities, including learning centers, math/science and health experiments, and social studies projects. They also frequently cited using more enrichment activities such as creative writing, music, art, drama, newspapers in the classroom, and supplemental activities included in adopted reading and language arts texts. Still others used the new available time to cover the required basic material in more depth. These teachers reported, for example, engaging in more frequent and more lengthy discussions with children, spending the time necessary to insure that each child understood the material, having more opportunities for children to work at the board, and making greater use of reference materials when appropriate.

Regular/aide class teachers explained that the aide could help provision, monitor, supervise, and clean up projects, hands-on activities, and learning centers. Small class teachers related how having fewer children meant that implementing such projects was more manageable, that increased available space allowed more movement and student interaction, and that monitoring and supervision of these learning activities was easier. Both small and regular/aide class teachers felt that having either fewer children or a full-time aide made it easier and less risky to provide a wider range of developmentally appropriate learning opportunities for primary grade children.

b. Individualizing Instruction

Increased opportunities for more individualized instruction emerged as a second dominant theme when small and regular/aide class teachers talked about differences between teaching in a small or regular/aide class and teaching in a regular class. These differences became apparent as teachers described instructional processes and strategies in relation to planning, grouping, monitoring student work, and using learning centers and enrichment activities.

Small and regular/aide class teachers also related the increased amount and rate of content covered to their increased ability to individualize instruction. Because they knew that with a small class or with a full-time aide they could complete the required objectives within the time allowed, student papers were more often checked on the spot, and then immediate feedback and reteaching was provided by the teacher or the aide.

Teachers reported that with fewer children or with a full-time aide, instruction took less time because students were more on task and could get help quickly when needed. Teachers attributed this difference to increased ability to monitor student behavior and academic progress, describing how management and supervision was easier with fewer children or with a full-time aide. Teachers reported having a better sense of what was going on in the classroom, of what children were or were not doing. Regular/aide class teachers, in particular, felt they were able to deliver unhurried assistance if a child needed it, because the aide was available to monitor and supervise the rest of the class. Small class teachers also noted that they could make more efficient use of available time because they had more specific knowledge about each child's level and instructional needs.

(1.) Planning and grouping for instruction.

Most small and regular/aide class teachers reported no difference between planning for a small or regular/aide class compared to a regular class, though a few reported spending less time in planning. Several small class teachers reported spending more time planning because the class was constantly progressing and needed fresh challenges. Similarly, several regular/aide class teachers reported spending more time planning the aide's work, in addition to their own. Most small class teachers reported using fewer reading groups and indicated that this made time available for other activities. Small and regular/aide class teachers also reported that, more often than in the past, they formed impromptu or specialized groups to better meet more learning levels.

Regular/aide class teachers generally reported that working with groups was easier than when they had no aide assistance. The aide allowed more time for teaching and a greater degree of instructional individualization. Teachers described using the aides to work with individuals and small groups of children who were having difficulty mastering the objectives. Teachers noted that the aide's assistance with clerical and administrative tasks allowed them more time to work with groups. The aides also allowed teachers longer and more uninterrupted periods of small group instruction by monitoring the rest of the class while the teacher worked with the group.

(2.) Monitoring and evaluating student learning.

Most small and regular/aide class teachers reported that monitoring and evaluating student progress was easier, required less time, was more efficient, and resulted in greater individual attention than was their experience teaching in a regular class. The most common explanation offered was that with fewer children or a full-time aide, teachers could check papers on the spot and then give each child immediate feedback. Difficult content could be retaught to individuals or small ad hoc groups as needed. Similarly, with fewer children or an aide in the classroom, teachers were able to monitor children's work more closely during the act of instruction, so that monitoring and reteaching were simultaneous. Several small class teachers indicated that they could use fewer written tests because they had more detailed knowledge of each child's progress based on daily work and their individual interactions with each student.

In most cases small and regular/aide class teachers connected the faster, more frequent, and more individualized feedback to increased opportunities for immediate reteaching. These teachers also related improved monitoring to better ability to match instruction to the needs of above and below average students in the class. Second and third grade teachers in particular noted that children who were having problems were more likely to ask questions and request help than in a regular class. Many teachers also explained that the improved monitoring was also connected to greater opportunities for individualized enrichment activities for children.

A concern expressed by a few small class teachers was that increased monitoring was necessary because small class students had come to depend on quick help or feedback from the teacher. One teacher explained that "kids have come to expect more monitoring," and another noted that "children almost demanded more immediate feedback." Another teacher who observed that the children had grown accustomed to the increased attention from and interaction with her also pointed out that in exchange her children were more willing to ask questions and more willing to say that they did not understand.

While most regular/aide class teachers reported that they had a better sense of individual student progress, a few regular/aide teachers expressed a contrasting concern. Some teachers noted that because the aide was checking most of the papers, the teacher was not as aware of what immediate reteaching was needed by each child.

(3.) Matching instructional and student ability levels.

In general, small and regular/aide class teachers indicated that it was much easier to match the level of their instruction to the level of the student's ability than it had been when they taught in a regular class. Their explanations for this related to having more detailed and accessible knowledge of student ability levels and to having the time to provide immediate, individual attention to students.

Some second and third grade small class teachers reported that their classes were more homogeneous than any class in the past, so matching the level of instruction was not difficult. Small class teachers reported that in particular it was easier to individualize instruction for students having learning problems than in a regular class. Having the time available for immediate monitoring and reteaching was described as critical in this regard. Recall that some teachers perceived students in small classes to be more willing to seek the teacher's help. Others have observed that in contrast to children in regular classes, children in small classes acted to adjust the match between the level of instruction and their own ability level by demanding help if they were having trouble.

Regular/aide class teachers described an improved match as a result of the aide working one-to-one with children who were having difficulty learning. They described how the aide contributed to an improved instructional match through increased use of learning centers and enrichment activities. Regular/aide class teachers described how the aide was used as a roving tutor to answer children's questions who were engaged in assigned seatwork while the teacher was leading small reading groups. They described how the presence of the aide to supervise and monitor the class allowed the teacher to work one-on-one or in small ad hoc groups with children who were experiencing difficulties. Finally, regular/aide class teachers described how the presence of the aide provided more detailed knowledge of each child's ability level, thus allowing a more precise match of assignments and ability.

(4.) Teacher-student academic interaction.

Most small and regular/aide class teachers responded that they had experienced significant differences in the degree of active teacher-student academic interaction when compared to their experience teaching in a regular class. Generally small class teachers described class discussions were more frequent and reported that all children in the class tended to be involved in these discussions. Teachers reported that they employed more higher level thinking activities and that they were better able to insure that all children could participate.

Second grade and particularly third grade small class teachers observed that the children appeared to be less inhibited, and less afraid of being wrong and that they volunteered to answer questions more often. One teacher observed, "They feel safe with their ideas and they're not going to be put down." Teachers described children in small classes as more curious, enthusiastic, and eager to participate than were children in their regular classes. Several teachers noted that this was particularly the case in their low achieving reading group.

Some regular/aide class teachers related that having two adults in the classroom meant that children could receive twice as much interaction as before. Others described how the presence of the aide resulted in more personal attention to individual children, and improved knowledge of children as individuals. Some regular/aide class teachers explained that the instructional time spent with children was more concentrated because having the aide in the classroom meant that behavior was better and therefore the teacher could devote undivided attention to those children she was teaching.

(5.) Learning centers and enrichment activities.

Small and regular/aide class teachers reported providing children with learning opportunities beyond 'traditional whole group and seatwork instructional patterns more often than they had been able to provide when teaching a regular class. In particular, they described using more learning centers and implementing activities such as cooking, special art, music, drama, field trips, science and math experiments and demonstrations, social studies projects, creative writing, and parent or volunteer speakers from the community. They also reported making more use of supplemental instructional materials and enrichment activities provided in the adopted reading and math textbooks. Teachers appeared to be more willing to implement complex or messy activities because more classroom space was available or because they, or they and the aide, could adequately monitor and supervise the activity.

Small and regular/aide class teachers also reported having time to make more use of learning centers than they could in a regular class. Small class teachers noted that with fewer children, each child could go to centers more often and stay for longer periods of time. They observed that the quality of time children spent in centers was better than before, children were not as rushed, there was more available space, and there were fewer children to share limited materials. These conditions contributed to less friction and fewer discipline problems during center work. Moreover, small and regular/aide class teachers reported improved ability to monitor and supervise children working in centers.

4. The Learning Environment in Small and Regular/Aide Classes

Teachers experienced fundamental differences in the physical, social, and emotional classroom work environment in small or regular/aide classes as compared to their experience in regular classes. They told interviewers about the classroom's physical environment, interpersonal relations among teacher and students, parent relations, classroom management, and their own morale as teachers. Differences in availability and use of time during the school day and opportunity to know and respond to children on a more individualized basis characterized small and regular/aide class teacher perceptions of their classroom environment.

a. Interpersonal relations.

Small and regular/aide class teachers indicated that they had better knowledge of children as individuals, their families and their home background; that their relations with children were improved; and that children's relations with each other were more positive. Teachers reported that more time was available to listen to children, and to learn about their personal lives and concerns. Conversely, teachers also perceived that children knew more about the teacher as an individual with a history, interests, and a life outside of school. Teachers reported feeling more like a part of the class. Small class teachers noted that children were more willing to approach the teacher, and that they more frequently initiated conversation with teachers about personal matters.

Differences in relations among children were consistently noted by small class teachers. Small classes were frequently described as like a family. For the most part children in small classes were described as unusually cooperative, supportive, tolerant, and caring. Teachers noted that children stood up for each other and that children were more willing to take risks in class. Children encouraged classmates to try, and they would not accept less than a good effort from their peers. Small class teachers described their group as more cohesive and noted that there was less bickering than in regular classes.

An unavoidable feature of Project STAR's within-school research design meant that children attending small schools serving stable school populations spent four years in a small class with essentially the same fifteen or so classmates. It could be argued that the closeness among children resulted from being together in the same small group for four years. However, kindergarten teachers made the same observations about relations among children and to the same degree as did their first, second, and third grade counterparts. Some second and third grade teachers reported that when the small class membership had remained essentially intact for three or four years, children often did not get along well and were not receptive to new classmates entering the group. This finding appears to be an artifact of the research design and was not reported in instances where small group membership varied from year to year.

Kindergarten through third grade regular/aide class teachers were overwhelming in their response that there had been more individual attention to students as compared to their experience teaching in a regular class without aide assistance. Teachers reported that children received more emotional and social attention from the teacher and the aide. The pace of the classroom was more relaxed and teachers commented that they were more relaxed and more open to non-academic interactions with children. Teachers did not feel as rushed because the aide was there to handle matters if necessary. Many teachers explained that with two adults in the classroom it was possible for someone to be available to listen to children when they needed to ask an academic question or when they needed to talk about a personal matter.

b. Classroom Physical Environment.

Small class teachers identified increased classroom space, better use of classroom space, and lower noise levels when describing the differences between teaching in a small size and in a regular size class. Teachers referred generally to "more space", reporting that they kept the same room arrangement but simply spread out more; some cited increased space between children's desks, while others noted broader pathways for movement within the room. Teachers reported allowing children more freedom to move about the room than they had in a regular size class.

When small class teachers spoke in detail about how they utilized the increased space, they frequently reported providing more activity/interest/learning centers, as well as increased space for children to work on the floor for art projects, games, reading, and for increased opportunities for children to work in partners and small groups for independent, cooperative learning. They variously described lower noise levels in the classroom, higher levels of productive noise, and their own increased tolerance for noise and movement.

Regular/aide class teachers reported that the aide helped to better manage available classroom space by monitoring and directing the traffic flow while the teacher was engaged in instruction. Several teachers noted that the noise level was lower because the aide helped keep things quiet, particularly when the teacher was engaged in instruction. In contrast, some teachers noted that having two adults working in the classroom at the same time resulted in higher noise levels. Some perceived this to be a distraction; others did not mind since it was productive noise.

c. Managing the behavioral environment.

Both small and regular/aide class teachers reported striking differences in managing classroom rules, procedures, and student behavior in contrast to teaching in regular classes. The overwhelming comment was that classroom management was easier and that there were fewer behavior problems than in a regular size class. The primary explanation offered by small class teachers for this difference was that with fewer children to monitor it was easier to be aware of potential problems before they became problems. With fewer children teachers reported they could respond faster and that their response was more considered and individualized. Teachers felt more proactive and less reactive. Regular/aide class teachers attributed differences in classroom management to having a full-time aide who could provide more attention to children while the teacher was engaged in instruction. Teachers felt that increased attention from two adults reduced the likelihood that children would try to misbehave. Further, teachers reported that having the aide present in the classroom meant that problems could be dealt with immediately rather than having to wait for a break in class instruction.

d. Quality of teacher work life.

Teachers reported differences in their morale and work attitudes when teaching in small and regular/aide classes. They reported feeling more relaxed, less pressured, and more satisfied at the end of the day. They felt less pressured because they knew they would be able to get the required basic instruction completed. They felt more satisfied because they were able to interact more frequently with each child on both a personal and academic level, because they did not have to be as controlling, and because they had the time to more be flexible in meeting individual student needs using more developmentally appropriate approaches. Their satisfaction extended to their home life, with many teachers reporting that they did not take as much work home as they had when teaching a regular class. In sum, small and regular/aide class teachers felt as though they could accomplish more using more desirable methods than they could when teaching in a regular class.

5. Conclusions From Teacher Exit Interviews

Based on four years of interviews, the following differences were apparent between instruction in small and regular/aide classes and instruction in regular classes. Basic instruction was completed more quickly providing more time for covering additional basic material, use of supplemental text and enrichment activities, more in-depth instruction regarding the basic content, more frequent opportunities for children to engage in first-hand learning activities using concrete materials, and increased use of learning centers. These patterns emerged in kindergarten and continued through the third grade.

Improved individualization instruction also emerged as a dominant theme in teachers' perceptions of differences between instruction in small and regular/aide classes and regular classes. Again citing extra available time as the crucial factor, small and regular/aide class teachers reported increased monitoring of student behavior and learning, opportunities for more immediate and more individualized reteaching or enrichment, more frequent interactions with each child, and a better match between each child's ability and the instructional opportunities provided. Small and regular/aide class teachers perceived that they had a more detailed knowledge of each child's needs as a learner, and the necessary time to meet individual learner's needs using a variety of instructional approaches. Small class size or the presence of a full-time teacher's aide fostered the increased use of learning approaches generally considered by educators to be highly desirable primary grade practices.

Significant reduction of class size, or the addition of a full-time teacher's aide also made positive changes in the physical, social, and emotional environments in primary grade classrooms. Classrooms were more pleasant for both teachers and students. Teachers and students were under less stress and learning occurred in a more relaxed atmosphere. Students were less likely to get lost in the crowd and were more likely to have their own unique needs met by adults who understood them as individuals. The extent to which teachers, aides, and children were friendly, supportive, and trusting of one another was an indication of the peer cohesion of children and the esprit de corps of the group as a whole (Johnston & Davis, 1989). Further this dimension is an indicator of classroom morale and the sense of team spirit that is characteristic of effective elementary schools.

B. Teacher Grouping Practices

1. Data Collection Procedures

Grouping practices of all Project STAR K-3 teachers were explored through a self-report instrument, the Instructional Grouping Practices questionnaire. Teachers were asked to report, in relatively low inference terms, information about the ways in which they arranged children in groups for instruction: in what subjects children were grouped on a regular basis, the number of groups in reading and math, criteria employed in assigning children to groups, and the extent to which children were moved from one group to another during the school year.

Few differences were observed between K-3 small, regular, and regular/aide class teachers' instructional grouping practices. K-3 teachers, regardless of class type, continued to form small instructional groups for teaching reading whereas math instruction was generally carried out with the whole class. Given Tennessee's highly structured, state mandated basic skills curriculum and concomitant teacher evaluation procedures, it is not surprising that traditional grouping practices for math and reading instruction are resistant to change as a result of reduced class size.

2. Discussion and Summary

Project STAR K-3 teachers were most likely to employ three small groups for reading instruction and to teach math to the class as a whole group. While none of the differences were statistically significant, small and regular/aide class teachers more often used two or more groups for math instruction than did their regular class counterparts. Similarly, small class teachers more often reported using fewer reading groups than did regular or regular/aide class teachers, though again, the mean number of groups was not significantly different. Skill level was the primary basis for assigning children to reading groups, and most teachers (86%) reported that they occasionally moved children among groups throughout the year.

Project STAR K-3 teacher responses to the Instructional Grouping Practices questionnaire provide no surprises. No significant differences in responses to the questionnaire items were noted among class types. As expected, almost all teachers did group for instruction in reading, whereas only about a fourth reported forming instructional groups on a regular basis for teaching math. Also as expected, almost no teachers formed instructional groups on a regular basis for teaching science or social studies.

Small class teachers averaged slightly fewer reading instructional groups than did regular class teachers. Regular/aide class teachers had slightly more reading groups than either small or regular class teachers. Small and regular/aide class teachers more frequently reported using two or more groups for math instruction than did regular class teachers.

Children were assigned to reading groups based on their skill level. Since most math instruction occurred in a whole class, single group format, ability grouping was not employed. When teachers did group for math instruction, children were assigned to groups based on their skill level. It appears that when instructional groups are employed, as in reading, children are moved among groups during the year.

The picture that emerges from the Project STAR K-3 teacher responses on the Instructional Grouping Practices questionnaire supports the view that the fundamental organization of classroom instruction is not affected by significant reduction in class size or by the addition of full-time teacher aides (Cahen, et al., 1983; Mitchell, et al., 1989). Some regular/aide class teachers did employ more groups for reading and math, and some small class teachers did form smaller groups for math instruction. On the whole, however, most teachers did not take advantage of smaller classes or teacher aides to change their basic approach to grouping for instruction.

As noted above, the presence of a highly structured basic skills curriculum in combination with a teacher evaluation system that is closely linked to adherence to the curriculum exerts strong pressure on classroom teachers to maintain traditional practices. Moreover, teachers received no training in alternative grouping approaches or instructional strategies related to new grouping possibilities. Thus, the effect of reduced class size or a full-time teacher's aide in combination with focused training and the opportunity for curricular modification is not known.

The Project STAR K-3 Instructional Grouping Practices questionnaire did not address the extent to which teachers employed temporary or ad hoc instructional groups. However, the K-3 teacher exit interviews indicate that small class and regular/aide class teachers made more frequent use of ad hoc instructional groups than they had when teaching in a regular class. Moreover, regular class teachers did not report these differences during the exit interviews.

C. Parent/Volunteer-Teacher Interaction

Interaction between parents, volunteers and Project STAR kindergarten, first, second, and third grade teachers was examined using the self-report instrument, Parent/ Volunteer-Teacher Interaction questionnaire.

Teachers were asked to 'indicate the weekly, monthly, and yearly frequency of a variety of contacts with parents and other volunteers. They were asked to report the nature, method, and weekly frequency of contacts with parents about their child's learning or behavior; the monthly frequency of a hierarchy of parent/volunteer involvement activities in the classroom; and the monthly and annual frequency of home visits. They were also asked to indicate their overall satisfaction with the level of parent-teacher interaction in their classroom.

1. Communication with parents

Teachers were asked to report the weekly frequency of contacts with parents about misbehavior or learning problems and about good behavior or learning accomplishments -- how frequently during the past full week they had made phone calls, sent notes home to parents, or held face to face conferences. Teachers were also asked to indicate the frequency with which they sent home suggestions for activities to be done at home or information about topics of study. No significant differences were found among small, regular, and regular/aide class teacher responses to these items, although small class teachers consistently averaged slightly fewer contacts with parents regarding student behavior or academic performance than did regular or regular/aide class teachers. Similarly, regular/aide class teachers averaged slightly more contacts with parents regarding classroom activities and ways that parents could support their child's learning at home than did regular class or small class teachers. Most teachers, regardless of class type, reported that within the previous four weeks, they had sent four written communications about curriculum matters home to parents. This once a week pattern is consistent with general primary grade practice. Most K-3 teachers reported that they did not make professional visits to student's homes. No significant class type differences were observed for those teachers (between 10-15%) who reported making such visits.

2. Parent/Volunteer Involvement in the Classroom

Teachers indicated the monthly frequency with which parents or volunteers were involved in different levels of classroom activities. Teachers were asked about involving parents or volunteers in (a) maintenance tasks, (b) supervision tasks, (c) clerical tasks, (d) drill-teaching tasks, and (e) creative teaching tasks. No significant differences were found among small, regular, and regular/aide class teacher responses to these items. It should be noted that among K-3 teachers overall, regular/aide class teachers made slightly less frequent use of parents or volunteers than did small or regular class teachers. This finding is consistent with teacher interviews with regular/aide class teachers in which they explained that since they had a full-time aide, they did not have as much need to involve parents or volunteers.

3. Discussion and summary

There appears to be neither significant differences nor readily observable patterns of differences in parent/volunteer-teacher interaction among small, regular, and regular/aide class teachers. Perhaps because the perceived need was greater, regular class teachers reported more frequent involvement of parents in classroom activities and support than did small or regular/aide class teachers. Throughout the K-3 grades, having a full-time teacher aide assigned to a teacher appeared to reduce the need for and hence the frequency of involvement of parents or volunteers in classroom activities. Also, small class teachers appeared more likely to phone, write, or confer with parents about student accomplishments and good behavior than did regular class teachers. Small class teachers also reported slightly less frequent communication with parents regarding student mis-behavior or learning problems. One possible explanation for this finding emerged from the teacher interview data. Small class teachers reported that they were better able to prevent problem behavior from happening and to solve misbehavior problems in class. In short, small class teachers may have not felt the need to involve parents in solving classroom behavior problems.

D. Teacher Problems

1. Data Collection Procedures

To examine the relationship between teachers' perceptions of their work-related problems and class type, Project STAR asked K-3 teachers to complete a slightly modified version of the Teacher Problems Checklist (Cruickshank & Myers, 1980). This instrument, modified by the addition of a single item regarding teacher aides, consisted of 61 problem statements to which teachers responded on a five-point frequency scale (always, occasionally, never) and on a five-point Bothersome scale (extremely, somewhat, not at all). Thus, for each of the 61 specific problem statements, teachers provided information about the extent to which the problem was perceived to be bothersome and the frequency with which the problem was experienced.

No significant differences were observed between class type and teacher-perceived problems. For K-3 teachers, regard-less of class size, problems related to time were more frequent and more bothersome than other types of problems. The three problem statements, (a) I have a problem having enough time to teach and also to diagnose and evaluate learning, (b) I have a problem having enough preparation time, and (c) I have a problem having enough free time, were consistently observed to be the top ranked problems both for Bothersomeness and Frequency for all kindergarten through third grade teachers.

2. Discussion

The extensive literature on teacher problems (Veenman, 1984) strongly suggests that classroom management and control of student classroom behavior is the most significant problem area for teachers. The findings from Project STAR contradict this view of teacher problems and indicate that problems related to time are the most frequent and bothersome work-related problems perceived by these K-3 teachers. Other recent studies (Bainer, 1988; Hines Mann, Swarzman & Hogan, 1988; and Manaf, 1987) also report time to be the most prominent global area for elementary school teachers and suggest it may be due to increased accountability expected of teachers and to additional content topics added to the traditional reading, language arts and math subjects normally taught in the early elementary grades. The ascendancy of time as the most troublesome problem area may be the result of a pervasive and salient focus on time and how best to use it in schools. Tennessee's basic skills curriculum is complex and teachers are held accountable for seeing that students progress through the specified curriculum at the expected rate. In many Tennessee schools teachers are accountable to supervisors and evaluators who step into their classroom and expect to find the teacher covering a particular unit, in a particular fashion, at a particular time. Thus, it is not surprising that Project STAR teachers perceive time to be a salient and bothersome problem area.

E. Effects of Reduced Class Size on Curriculum, Instruction, and Teacher-Child Interactions

Class size reduction and the use of full-time teacher aides does move curriculum in the direction of developmentally appropriate practice and away from practices considered inappropriate. The effect, however, appears to be limited, particularly by the presence of a single, highly structured curriculum organized around direct instruction of reading, language, and math basic skills. Class size reduction or the use of full-time teacher aides does contribute to increased opportunities for children to select from a somewhat wider range of learning activities; they contribute to a more individualized application of the mandated curriculum; they contribute to increased teacher awareness of their students' social and emotional development; and they contribute to increased opportunities for children to interact with each other while engaged in learning activities. Moreover, small class sizes or the use of full-time aides appear to contribute to richer content and more in-depth coverage of subject matter content.

Bredekamp (1987) asserts that the developmental appropriateness of an early childhood program is most apparent in interactions between adults and children. Significant reduction of class size or the presence of a full-time teacher's aide appears to make a positive contribution to the developmental appropriateness of adult-child interactions in the primary grades. Within the confines of a structured, highly prescribed reading, language, and math basic skills curriculum, K-3 classes of about 15 children or classes of 25 children with a teacher and a full-time paraprofessional seem to foster instructional interactions that are more individualized than does the more traditional class size of about 25 children with a single teacher. Small class teachers are more knowledgeable about the instructional needs of the children in their classes. Small and regular/aide class teachers are more likely to report employing teaching strategies that are considered to be developmentally appropriate than do teachers in regular size classes of about 25. Small classes, and to a lesser extent, regular/aide classes foster more developmentally appropriate non-academic interpersonal interactions between adults and children and among children themselves. Reduction of class size or the presence of a full-time teacher's aide appears to have resulted in increased positive attention to children's social and emotional growth and development. Small and regular/aide class teachers reported that they were more cognizant of children's individual social and emotional needs and problems than they had been in the past.

VIII. Additional Findings

The data collected in this large study provided information about areas not mandated by the legislation. This included the effects of class size in relation to the following: retention, race, sex, socioeconomic status, attendance of teachers, and at-risk students.

A. Student Socioeconomic Status in Project STAR

In order to compare the value of small classes for children from low socioeconomic homes and for children from higher socioeconomic homes, the students were identified as low or high SES based on eligibility for free or reduced lunch. Although this measure of SES is not a highly accurate measure, it was the only one available in school records. The number of students in the two groups were approximately the same. These numbers remained relatively stable throughout the four years of the study (Table VIII-1).

In 1988-89 (third grade) 50 percent of the STAR students were on free lunch. The Tennessee state average for that year was 42 percent on free lunch and 58 percent not on free lunch.

Analysis of data dealing with the effect of small and regular/aide classes on students relative to their socioeconomic status can be found in Appendix F, item 1.

Additional findings concerning the effect of small and regular/aide classes on "at risk" students is discussed in Appendix F.

B. Sex Differences in Project STAR

Primary analysis of Kindergarten and Grade 1 data included the effect of class size on the performance of females and males. In kindergarten females outperformed males in kindergarten results on all achievement measures over all classes (.05). The differences were most pronounced in urban schools in reading and in inner city in math. There was no interaction of sex X class type. Small classes on the average were superior to regular and regular/aide classes for both boys and girls. There were no sex differences on non-cognitive measures, and the higher average non-cognitive scores found in small classes were equally true for both sexes. Males were more variable than females in their non-cognitive measures.

In grade one, female students exceeded males on all reading measures, i.e. word study, reading, and total reading. The sex difference was consistent across all locations and all class types, ($p<.001$). There was no significant difference between males and females on listening and math. Females exceeded males on motivation on the average, but the difference was small. The difference was reversed or non-existent in inner-city schools. Females exceeded males on both BSF Reading measures. The sex difference was consistent across all locations and all class types. There is no difference on BSF Math. In second and third grade, primary analysis of sex differences was not conducted. This was because there would be no policy advantage to determining that small classes are more advantageous for one sex than the other.

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TABLE VIII-1

Number of Free/Reduced Lunch and Non-Free Lunch Students in Kindergarten through Third Grade by School Type

Inner-City

	Free/Reduced Lunch	Non-Free Lunch
Kindergarten	1,255 (88%)	166 (12%)
First Grade	1,242 (91%)	120 (9%)
Second Grade	1,303 (91%)	131 (9%)
Third Grade	1,183 (90%)	130 (10%)

Rural

	Free/Reduced Lunch	Non-Free Lunch
Kindergarten	1,182 (41%)	1,723 (59%)
First Grade	1,337 (43%)	1,763 (57%)
Second Grade	1,273 (42%)	1,764 (58%)
Third Grade	1,281 (41%)	1,830 (59%)

Urban

	Free/Reduced Lunch	Non-Free Lunch
Kindergarten	237 (42%)	328 (58%)
First Grade	307 (50%)	305 (50%)
Second Grade	177 (47%)	201 (53%)
Third Grade	226 (50%)	226 (50%)

Suburban

	Free/Reduced Lunch	Non-Free Lunch
Kindergarten	377 (27%)	1,028 (73%)
First Grade	540 (35%)	1,026 (66%)
Second Grade	586 (36%)	1,065 (65%)
Third Grade	603 (37%)	1,042 (63%)

C. Race Differences in Project STAR

The total population of Project STAR by race by school type by grade is found in VIII-2. Ninety-eight percent of the minority students in Project STAR are Black; less than 2% of the minority students are Hispanic or Oriental. Black students were 32% of all students; Black students made up 95% of the inner-city school population, but only 8% of the rural schools population.

Table VIII-2

Numer of Students by Race by School Type by Grade

Kindergarten

	% White		% Minority	
Inner City	4%	(N=58)	96%	(N=1362)
Suburban	68%	(N=952)	32%	(N=453)
Rural	94%	(N=2717)	6%	(N=188)
Urban	86%	(N=488)	14%	(N=77)

First Grade

	% White		% Minority	
Inner City	4%	(N=52)	96%	(N=1303)
Suburban	61%	(N=953)	39%	(N=610)
Rural	93%	(N=2850)	7%	(N=229)
Urban	85%	(N=521)	15%	(N=91)

Second Grade

	% White		% Minority	
Inner City	3%	(N=44)	97%	(N=1365)
Suburban	58%	(N=942)	42%	(N=688)
Rural	93%	(N=2800)	7%	(N=202)
Urban	86%	(N=321)	14%	(N=51)

Third Grade

	% White		% Minority	
Inner City	3%	(N=41)	97%	(N=1270)
Suburban	57%	(N=935)	43%	(N=697)
Rural	94%	(N=2905)	6%	(N=201)
Urban	90%	(N=408)	10%	(N=43)

Detailed analyses of STAR data included a study of the possible variable impact of class type (small, regular, regular/aide) on students of different races. These analyses followed the same basic format described previously in the report. An attempt was made to do a single-race analyses. A single race class was defined as a class that was made up of one race with no more than two of another race. There was not enough of these types of conditions to do a complete analysis: race x location. These and class type x race x location interactions could not be tested. Another analyses that was not run was free lunch/non free lunch x race x location. There were not enough minority students who were not on free lunch in any area to constitute an adequate sample.

This made it impossible to completely separate race and SES in any analysis. For all grades and all locations over 50 percent of the minority students were on free lunch. This was true for whites in only two instances. In inner city first and second grades over 50 percent of the whites were on free lunch. (See Table VIII-3.)

TABLE VIII-3

Number of Students by Race by School Type by SES by Grade

Kindergarten

	White				Minority			
	Free Lunch		Non-Free Lunch		Free Lunch		Non-Free Lunch	
Inner City	50%	(N=29)	50%	(N=29)	96%	(N=1225)	10%	(N=137)
Suburban	14%	(N=131)	86%	(N=821)	54%	(N=246)	46%	(N=207)
Rural	39%	(N=1050)	61%	(N=1667)	70%	(N=132)	30%	(N=56)
Urban	37%	(N=182)	63%	(N=307)	72%	(N=55)	28%	(N=22)

First Grade

Inner City	56%	(N=29)	44%	(N=23)	93%	(N=1206)	7%	(N=97)
Suburban	17%	(N=161)	83%	(N=787)	61%	(N=373)	39%	(N=237)
Rural	41%	(N=787)	59%	(N=1694)	72%	(N=165)	28%	(N=64)
Urban	46%	(N=24)	54%	(N=280)	73%	(N=66)	27%	(N=25)

Second Grade

Inner City	57%	(N=25)	43%	(N=19)	92%	(N=1253)	08%	(N=112)
Suburban	17%	(N=158)	83%	(N=784)	60%	(N=416)	40%	(N=272)
Rural	40%	(N=1109)	60%	(N=1691)	69%	(N=139)	31%	(N=63)
Urban	43%	(N=137)	57%	(N=184)	71%	(N=36)	29%	(N=15)

Third Grade

Inner City	46%	(N=19)	54%	(N=22)	92%	(N=1162)	08%	(N=108)
Suburban	18%	(N=168)	82%	(N=767)	62%	(N=430)	38%	(N=267)
Rural	39%	(N=1138)	61%	(N=1767)	69%	(N=139)	31%	(N=62)
Urban	48%	(N=194)	52%	(N=214)	76%	(N=32)	24%	(N=11)

Kindergarten

On average, white students outperformed minority students on all achievement measures. There were no race differences in the non-cognitive measures. Minority students were more homogeneous (less variability) than white students on all four achievement measures (total math, sounds and letters, word study skills, total reading). On achievement measures, rural (predominantly white) schools outperformed inner city (predominantly minority) schools, and there was a **trend** (.06) of larger white-minority differences in regular classes than in small classes on the Sounds and Letters measure of the SESAT II. There were no differences between these two groups of classes on the non-cognitive (self-concept) measures. It appears that SES is a factor when the Free Lunch/Non-Free Lunch figures are considered. The non-free lunch group always does better than the free lunch group. There were no minority non-free lunch classes. In rural schools, 39% of whites and 70% of minorities were on free lunch and in the inner city 90% of minorities and 50% of whites were on free lunch. The highest percentage of non-free lunch minorities was in suburban locations. This was the only location where minorities equalled or outperformed whites. In all locations a much higher percent of minorities than whites were on free lunch.

First Grade

Whites exceeded minorities on the average on all SAT achievement measures. For the Stanford Reading Scale the race difference was reduced for inner city small classes. This difference was consistent for all locations and class types. There was a suggestion that the difference was smallest in small classes.

Minorities exceeded whites, on the average, on self-concept. The minority-white difference was largest in inner city; smaller or negligible in other locations. For suburban schools, there was little if any, difference between whites and minorities in small classes on BSF Math scores. In regular and regular/aide suburban classes whites outperformed minorities. In BSF Reading, minorities in small suburban classes outperformed whites in small suburban classes but not in regular or regular/aide classes. Minorities outperformed whites in small inner city classes on all BSF measures but, not in regular and regular/aide classes. When minorities in small classes were compared with minorities in large and aide classes, the minorities in small classes in inner city and suburban schools outperformed minorities in large and aide classes on the four BSF measures.

Second Grade

In second grade small classes and regular with a full-time aide classes helped whites and minorities equally. There were no significant race differences in the effects of small or regular with a full-time aide classes. Whites had substantially higher test scores than minorities in all class types and all school types. The small class advantage and all effects found for the total class applied equally for white and minority students.

Third Grade

Whites did better than minorities on SAT reading, math, listening, and language scores. The small-class advantage and all effects found for the total class applied equally for white and minority students with three exceptions. The race difference was reduced in small and regular/aide classes for reading measures. Whites did better than minorities for BSF measures. Again this difference is reduced in small and aide classes. Minorities scored higher than whites on self concept and motivation and the self concept difference was higher in small and regular/aide classes.

Summary

Inner-city whites performed better than minorities on achievement tests. However, the minorities made greater gains in inner city small classes. The minorities had a greater chance of catching up with the whites if they were in small classes.

The trend appeared also in suburban small classes with non-free lunch minorities performing as well as whites. In all cases the non-free lunch students perform better than free lunch students regardless of race. In all cases whites outperformed minorities except in suburban small classes. This appeared to be a result of socioeconomic status since 80% of the minority students were on free lunch and only 35 % of the whites were on free lunch.

D. Grade Retention in Project STAR

Grade retention in the early elementary grades is predictive of subsequent failure to graduate. Although students may be retained "for their own good," holding them back does not enable them to catch up later (CPRE, 1990; Shepard & Smith, 1989). Controlled studies of children matched on test scores show that those who are retained do less well when they do get promoted than those who are not retained (CPRE, 1990). Doyle (1989) traced three lines of research back more than 50 years and could find no research results supporting grade retention. Doyle reported a 1984 article in the **Review of Educational Research** by Holmes and Matthews who concluded that: "Those who continue to retain students at grade level do so despite cumulative research evidence showing that the potential for negative effects consistently outweighs positive outcomes." (Holmes and Matthews, p. 232 as reported by Doyle, 1989, p. 216). Therefore, if a small class or a regular class with an aide can reduce grade retention, this can be expected to improve student performance subsequently, as well as saving the additional costs involved in teaching the student for an additional year.

In Tennessee, about 6 percent of children in the K-3 grades are retained each year (see Table VIII-4). Statewide retention rates are highest in the first grade, where they are more than twice as high as in kindergarten or in grades 2 and 3. The retention rates for the Project STAR cohort are quite similar to the state totals.

For Project STAR students, grade retention was lowest in small classes, intermediate in regular classes with aides, and highest in the regular classes (Table VIII-4). Moreover, this pattern of less retention in small classes was consistent across all grades. The difference in retention rates between class types was statistically significant in grade 1 (x2 p< .001). The decision to retain a student was based on a number of factors in addition to performance on tests. Table 2 compares the average scores of students retained and those promoted in the three class types in kindergarten and in grade 3.

TABLE VIII-4

Percentage Retention In Grade by Class Type

Percentage	Small	Regular	Regular/Aide	Total	(N)	1985-86
Kindergarten	3.8	4.5	3.7	4.0	(253)	3.9
1st Grade	7.8	12.6	10.8	10.6	(726)	10.9
2nd Grade	4.7	5.6	4.0	4.7	(301)	5.1
3rd Grade	3.5	4.7	4.0	4.1	(260)	3.9
Average over 4 grades	4.9	6.8	5.7	5.8		5.9

Among promoted students, the average scores were highest in small classes. This reflects the earlier reported finding from Project STAR that small-classes enhance the academic performance of early elementary grade children. Among retained students, scores tend to be highest in regular classes. Retention decisions seem not to have been based solely on achievement levels.

The lower averages in small and regular/aide classes for the retained students suggest that only the poorest performing children were held back in these classes, with the more marginal students passed to the next grade. Teachers of regular classes, however, seem reluctant to promote marginal students, as the higher averages in these classes implied.

Grade retention in first grade was highest in inner-city schools and lowest in suburban schools (see Table VIII-5). Lower retention in small classes than in regular classes occurred in all school types, and regular/aide classes were in an intermediate position between small and regular classes. Since the patterns were quite similar in all grades and across all school types in the first grade, this increased confidence in the results.

The costs of retaining students are high. An immediate cost is the extra year of schooling (assuming that the retained student does not become a dropout) which, in the case of Tennessee, adds about 6 percent a year to the costs of schooling in each of the first three grades. Longer-term costs include higher dropout rates, lower graduation rates, lower future earnings, higher rates of delinquency and many other social pathologies associated with low academic achievement and eventual dropout. The lower retention rates in small classes and regular classes with aides can help avoid some of these costs.

TABLE VIII-5

Reading and Math Scale Scores of Children Retained and Promoted Kindergarten and Grade 3, Project STAR

	Reading			Math		
	Small	Regular	Regular /Aide	Small	Regular	Regular /Aide
Kindergarten						
Promoted	441.2	435.0	435.9	491.6	483.7	483.3
Retained	422.2	427.4	421.2	475.1	471.8	466.0
Difference	19.0	7.6	14.7	16.5	11.9	17.3
Third Grade						
Promoted	622.4	614.4	615.0	624.3	618.0	617.5
Retained	571.1	577.3	568.6	573.7	582.9	561.9
Difference	51.3	37.1	46.4	50.6	35.1	55.6

TABLE VIII-6

First Grade Retention Percentage by School Type and Class Type

School Type	Small	Regular	Regular/Aide	Total
Inner City	9.8	17.8	14.6	14.6
Suburban	5.1	8.8	7.5	7.3
Urban	9.4	15.0	15.9	13.7
Rural	7.9	11.7	9.7	9.9
Total	**7.8**	**12.6**	**10.8**	**10.6**

E. Subsidiary Studies

Another aspect of retention was considered when 3 schools had a first grade small class made up of retainees who had become a part of Project STAR due to their retention. The results of this small study made an excellent argument for small (1-15) transition first grade classes. (See Appendix G.)

1. A study was conducted using student level data provided by 140 Project STAR kindergarten teachers. The data indicated mastery or nonmastery of the 25 reading readiness objectives of the Tennessee BSF program. The lowest scores were made by inner city free lunch students in classes of 1-25. The highest scores for this group were in a small class 1-15. (See Appendix G.)

2. Teacher attendance records were studied to determine if class size produced a significant difference in a teacher's number of absences. Although no statistically significant difference was found, the kindergarten teachers with small classes perceived themselves as more effective and less stressed (Appendix G).

In first grade when 5 causes of teacher absence were added to the study of teacher attendance, personal illness ranked first. Significance was found between low math and reading achievement and teacher attendance and class size (Appendix G).

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IX. The Cost Effectiveness of Reducing Class Size or Adding Aides

1. Introduction

The cost of making a change is always a consideration in deciding whether it will be possible or desirable to make the change. Costs should be examined in relation to the benefits; a costly program that brings large benefits will be a better bargain than an inexpensive program that does nothing for the students.

Since a substantial reduction in class size is costly, the legislation establishing Project STAR directed that estimates of the cost of reducing class size be made. The estimates of cost are related to the benefits in increased student achievement, to produce a cost effectiveness ratio that estimates the amount of benefit per unit of cost increase.

The estimation of costs is usually straightforward, but the estimates of benefits is more complex. Class-size reduction, for example, produces immediate benefits for teachers and immediate benefits for student learning, but it may also have other longer-term or indirect effects that are much harder to identify and measure. These estimates of Project STAR costs and benefits concentrate on immediate benefits to student achievement. This allows these estimates to be compared with any other program or treatment that is also aimed at increased student performance. Levin, Glass and Meister (1984) used this methodology to estimate costs and benefits of four different educational interventions, including reductions in class size. Project STAR estimates are calculated for both class-size reduction and the full-time aide, and these cost benefit ratios can be compared with estimates for any other intervention.

2. Estimating the Cost

The additional costs can be estimated on both a total basis for Tennessee (if kindergarten through grade three had class size reduced 15 to 1 statewide) and on a per-pupil basis, which would be applicable to whatever population of students was to be included in the policy (for example, if class-size reduction were targeted in schools with low-achieving students). If class-size reduction were implemented only for kindergarten and grade one, the two grades where the class-size effect is greatest, per-pupil estimates could be multiplied by the number of students involved to get an estimate of the total costs. Per-pupil cost additions can be expressed in both dollar and percentage terms. The percentages can be applied to the average cost per pupil in whatever future year the policy is implemented; this adjusts the dollar costs for effects of inflation in future years.

Estimating the cost of each individual student reduction in class size can also be done with this methodology, so the cost of reducing class size from 23:1 to 20:1 or 18:1 can be estimated. Project STAR has evidence on the benefits of an average of 15 to 1 as compared with an average of 23 to 1; the cost/effectiveness ratios are calculated for those class sizes. The cost estimates can be calculated for any class size. The effectiveness estimates can also be calculated on a proportional basis, although the study design does not allow us to say that a reduction from 23 to 19 would have half the effect of a reduction from 23 to 15.

3. Teacher Aides

Estimating the additional costs of a teacher aide is straightforward. If the salary cost of an aide is $8,000 and the benefits (social security, insurance) are 12 percent, the total cost of an aide is $8,960. Systems pay aides at different rates. The actual Project Star salaries were a little less than $8,000 in the base year 1987-88. The year 1987-88 was chosen as the base year because state comparative cost data was available, and this was a middle year in the project. Adding an aide does not increase capital or other operating costs appreciably. The aide's salary is the primary factor.

The operating cost per pupil in Tennessee in 1987-88 was $2,842. The average class size was 23 in the first three grades in Tennessee that year. The aide cost ($8,960) divided by 23 is $390 per pupil, which represents the additional cost per student from adding an aide. The additional per-pupil cost is $390 divided by $2,842, or 13.7 percent.

If better qualified aides were to be employed, requiring higher salaries, the percentage increase would be larger. If an aide were shared between two teachers, the percentage increase and cost per student would be cut in half.

4. Small Classes

Estimating the additional costs per student of small classes is more complex, because both increased operating costs, and the capital costs for additional classrooms must be taken into account. The data necessary to estimate the total capital costs are not available for Tennessee, because there is not a statewide space inventory that identifies how many additional classrooms are available in schools now and how many would have to be added. Project STAR data are not useful for making a statewide estimate, because the schools that participated either had to have the necessary space to accommodate any extra classes or they had to supply the space. Only two schools that participated had to add classrooms. Project STAR required smaller classes for only one grade per year. If the program were implemented in three or four grades at the same time, most schools would need extra classrooms. There probably is some available space in many schools across the state but we do not have a good estimate of how much.

Per-student cost estimates for reduction to 15 to 1 are made on two different bases: one, that an additional classroom would have to be added; or two, just the additional operating costs would be required. The primary additional operating costs would be for the additional classroom teachers and the additional cost of maintaining the space. Teacher salaries in 1988 averaged $23,300. When fringe benefits are added, the average total cost of adding one teacher would be about $28,500. Operation and maintenance of the physical plant is about 10 percent of the total budget. In 1988 in Tennessee, this averaged about $6,500 per classroom, making the total additional operating cost $35,000 per added classroom.

When translated to additional per pupil costs, teacher salaries would add 23.3 percent to per-pupil costs, and operating expense would add 5.3 percent, for a total additional cost of 28.6 percent. These are not precise estimates of actual salaries and additional maintenance costs because they will vary in different systems and at different times. A reasonable range would be between 27 percent and 30 percent. A one-third reduction in class size would not increase operating costs by one third, because the reduction would not affect transportation costs, supplies, or administrative costs.

5. Capital Cost

The cost per classroom added would be $60,000 to $70,000 (this assumes that no land purchase is required). If this is amortized over 30 years, the additional cost per year per classroom would be (assuming a 7 percent interest rate) $4,800 to $5,600. This would add an additional 4.0 to 4.6 percent per year to the costs per student. Thus in a school that had to add all the space, total costs per classroom would be $39,800 to $40,600 and additional costs per student would be $1,023 (1987-88 prices), or 32 to 33 percent higher, with a range of 31 to 34 percent.

Another approach to providing the additional classrooms would be to adopt a year-round school calendar which would provide the required 180 instructional days, staggered vacation times, and use of the buildings for 12 months.

6. Tennessee's Costs of Reducing Class Size or Adding an Aide

In kindergarten through grade 3 in 1989 there were about 11,410 classroom teachers (this excludes special education, Chapter One teachers, art, music, and P.E. teachers who do not have a regular class). There was an average daily attendance of 22.16 per classroom teacher, which works out to an average daily membership of about 23.5 to 1. To provide a full time aide for every teacher would require the addition of about 8,440 aides to the 2,970 that are currently employed as Basic Skills First aides. The cost of these additional aides, at $8,900 each, would be approximately 75 million dollars (1988 prices).

If class size were reduced to an average daily attendance of 15 students per teacher (an average membership of about 16 to 1), an additional 5,447 teachers would be needed. At an average cost of $28,500 (salary and benefits) per teacher plus an additional $6,500 per classroom in maintenance and operating expense (1988 prices), this would require about 191 million additional dollars.

table (IX-1) below shows the total costs for Tennessee of class-size reductions of various amounts at various costs per classroom.

Table IX-1

Additional Costs of Reducing Class Size to Specified ADA Levels for Different Levels of Teacher Salary (in millions)

	ADA Per Teacher		
Costs per Classroom	20 to 1	17 to 1	15 to 1
$35,000 (1987-88 costs)	44	121	191
38,500 (1988-89 costs)	47	133	210
44,000 (1988-89 costs & capital outlay)	54	152	240

7. Benefits

The benefits of a smaller class, or of a teacher aide can be estimated from the difference between achievement scores in small classes and regular classes (or between regular and regular/aide classes). These differences can be expressed as effect sizes. Project STAR effect sizes for reading and math scores (Stanford Achievement Test) are shown below for each year of the project[1] in Table IX-2.

Table IX-2

Effect Size by Grade for Small and Regular/Aides in Reading and Math

Test and Comparison	Kindergarten	Grade 1	Grade 2	Grade 3	Average of All Grades
Small and Regular					
Total Reading	.21*	.34*	.26*	.24*	.26
Total Math	.17*	.33*	.23*	.21*	.23
Regular/Aide and Regular					
Total Reading	.05	.15*	.11	.05	.09
Total Math	.02	.11*	.05	.03	.05

*Significant at $p < .01$

Another approach to calculating the benefits is to compare the average gains students make each year in small as compared with regular classes (or regular/aide compared to regular). Since there was no pretest for kindergarten entry, gain scores are available for only grades one through three. (The end of kindergarten test score is the pretest for grade one, etc.) The effect of small classes or of using teacher aides is their gain divided by the gain in the regular class. The result is expressed as a percent which indicates the percentage that small-class gain is greater than regular-class gain (see Table IX-3). A figure of less than 100 indicates that the regular (control) group had a larger gain score than the experimental group (either small or regular/aide). Gains in small classes in the first grade were about 15 percent greater than in the regular classes, while in the second grade, the small class had about 2 percent smaller gain in reading than the regular class. This table shows that the gains of a small class or a class with an aide are concentrated primarily in the first grade (and in kindergarten for small classes), and that gains in subsequent years are small or slightly negative (as compared with the regular class). The differences (effect sizes) are about the same from year-to-year because the gains obtained in kindergarten and grade one are maintained.

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[1] Effect size is the difference between the treatment group mean (the small class or the regular-aide class) and the control group mean (regular class) divided by the standard deviation of the control group. This expresses the experimental effect in standard deviation units. An effect size of less than .25 is considered small, an effect size of .25 to .5 is considered moderate, and an effect size of greater than .5 is considered large.

Table IX-3

Comparative Gain Scores

Comparison Group and Test	Grade 1	Grade 2	Grade 3
Small and Regular			
Total Reading	115.4*	97.6	94.3
Total Math	115.0*	102.5	95.9
Regular/Aide and Regular			
Total Reading	112.1*	101.7	96.1
Total Math	112.7*	106.6	102.6

*Gain Score Significant @ $p < .01$

8. Cost Benefit Comparisons

Cost benefit ratios can be calculated which show, for every $100 of additional cost, how many effect size points or gain percent points would be obtained. Total costs can be allocated among the different outcomes (reading and math) or a composite outcome can be estimated by averaging the two outcomes. In kindergarten through grade two, the greatest amount of time is spent on reading and language arts, and math is the second largest. Together, these two subjects take up about two-thirds of instructional time with one-third devoted to all other subjects (music, science, art, etc.). In third grade the emphasis on other subjects increases to about 50 percent of the total instructional time.

It is also possible to break down the math and reading time by the percent of time spent on each (based on teacher logs and observed lesson time in grades two and three). In the first two grades, almost twice as much time is devoted to reading as to math (65 percent versus 35 percent). In the third grade the ratio is 60 percent reading and 40 percent math. Calculations which weigh the costs of reading and math equally, and also which weigh the costs proportional to the average of time spent in each subject are presented in Table IX-4.

Table IX-4 indicates that small classes, either with or without capital costs included, are more cost effective than aides in kindergarten and third grade. In first grade small classes and aide classes have similar cost effectiveness when capital costs for small classes are included. In second grade, small classes are more cost effective for math than aide classes, but the two are similar in cost effectiveness for reading.

Table IX-4

Cost Effectiveness Ratios for Small and Regular/Aide Classes in Reading and Math, 1987-88 (Effectiveness measured by Effect Size)

Comparison Group, Subject and Weighting of Cost Allocation	Kindergarten	Grade 1	Grade 2	Grade 3
Math and reading equally weighted				
Small - Regular (without capital costs)				
Reading	.078	.126	.096	.120
Math	.063	.122	.085	.105
Small - Regular (with capital costs)				
Reading	.062	.100	.076	.096
Math	.050	.097	.068	.084
Regular/Aide - Regular				
Reading	.038	.115	.085	.050
Math	.015	.085	.038	.030
Math and reading proportionately weighted				
Small - Regular (without capital costs)				
Reading	.060	.097	.074	.100
Math	.089	.174	.121	.131
Small - Regular (with capital costs)				
Reading	.048	.077	.059	.080
Math	.071	.137	.096	.105
Regular/Aide - Regular				
Reading	.029	.088	.065	.042
Math	.022	.122	.055	.037

Effect size points per $100 per pupil of additional cost.

9. Discussion

Many research studies estimate benefits by effect sizes, and the cost effectiveness estimates in Table IX-4 can be compared with other interventions that have presented effect sizes and cost. The Levin, Glass and Meister (LGM) study (1984) provides the most direct comparisons since we used their methodology to compute cost effectiveness estimate. The LGM cost figures have to be adjusted for inflation from 1980 to 1988. When costs are expressed in percentage increases, they are quite comparable to those of Project STAR. Their effect sizes were based on a reanalysis of the Glass (1980) meta analysis data for class-size reductions from 35 to 20, which is a 43 percent reduction in size, as compared with a 33 percent average reduction in Project STAR. The LGM cost estimates include capital costs, and their estimate of cost increases is 43 percent for a reduction from 35 to 20.

The difference in estimates of cost effectiveness between Project STAR and LGM is primarily on the effect side. For a 43 percent reduction in class size, LGM estimated an effect of .11 for reading and .22 for math. Project STAR estimates (average of all four years) are .26 for reading, more than twice as high, and .23 for math, quite comparable. Project STAR was only in the early elementary grades, while the LGM covered all grades. Other summaries (Robinson & Wittbols, 1986) of research have indicated that the early elementary grades are the ones most likely to provide advantages for small classes. Another reason is that a reduction from 35 to 20 may not have a proportional effect to a reduction from 23 to 15.

LGM came up with an overall cost-effective ratio of about .09 for reading and math combined to a STAR cost-effective estimate of about .12, about one-third larger.

LGM compare cost-effectiveness for three other interventions: tutoring, lengthening the school day by one hour, and computer aided instruction (CAI). Lengthening the school day had a cost effectiveness ratio of .09, CAI had a ratio of .15, and cross-age tutoring had an effect of .22. The comparisons with Project STAR are shown in Table IX-5, with Project STAR cost-effectiveness ratios of Table IX-4 adjusted for comparability with the LGM estimate.

Table IX-5

Comparison of Cost-Effectiveness Ratios for Different Interventions

Project STAR, full-time aide	.09
Project STAR class size reduction from 23 to 15	.12
LGM class size reduction from 35 to 20	.09
LGM increasing instructional time one hour per day	.09
LGM computer aided instruction	.15
LGM cross age tutoring	.22
LGM peer component	.34
LGM adult component	.07

Source: Levin-Glass Meister Cost Effectiveness of Four Educational Interventions, Center for Educational Research, Stanford University, Project Report 84 A11 (1984) Table 4. Project STAR cost effectiveness ratios adjusted for inflation and averaged across reading and math for all four years.

X. Summary

A. Introduction

Project STAR was designed to be a definitive study of the effects of class size and the use of a full-time teacher aide on student achievement in the early elementary grades. The study was successful in guarding against major threats to validity; teachers were randomly assigned, students were randomly assigned by the schools in accordance with instructions which were audited, and testing was monitored. Because there were 328-346 classes at each grade level, when small classes were too large, or large classes were too small, they could be excluded from the analysis. Most of the analyses was performed on 305-310 classes. No serious threats to the validity of the study's results that could not be dealt with by exclusion were discovered. While the results can only be generalized to Tennessee schools teaching the Tennessee curriculum, Tennessee schools and students do not differ that much from schools in other states.

Tennessee students score somewhat above the national norms on the Stanford Achievement Test. As studies have shown that students in almost all states score above the national norms, Tennessee students may be about "average" in their ability. A state-prescribed set of learning objectives, the Basic Skills First program, is taught in all primary grades. The dominant instructional methods were drill and practice. Whole class instruction was dominant in math, and reading instruction was primarily done in reading groups.

B. Summary of Achievement Results

1. Kindergarten Class Size Effect

STAR's kindergarten results showed definite advantage for small classes in achievement but no significant advantage for the use of a teacher aide. The overall superiority of the performance of students in small classes on the tests used in STAR and the similarity of performance of students in regular and regular/aide classes are shown graphically in Figures X-1 and X-2 which present SAT scaled scores and percentile ranks on Total Reading and Total Math by class type and by grade.

2. First Grade Class-Size Effect

At the end of first grade, Project STAR students in small classes were outperforming students in regular and in regular/aide classes by substantial (statistically and educationally significant) margins on standardized tests and also on the state's Basic Skills First (BSF) test of reading and math. Small-class students scored at the 64th percentile in reading and the 59th percentile in math at the end of the first grade, while students in regular classes scored at the 53rd percentile (11 points lower) in reading and at the 47th percentile (12 points lower) in math. Students in regular classes with a full-time teacher aide outperformed students in regular classes in both reading and math. The presence of a teacher aide in grade one benefits student achievement but not as much as the small-class condition.(See Figures X-1 and X-2.)

3. Second Grade Class-Size Effect

Students in small classes continued to outperform students in regular and regular with a full-time aide classes on all tests in the second grade. There were significant advantages for students in small classes on the SAT in Reading, Math, Listening, and Word Study Skills, and a similar advantage on the Tennessee BSF tests in Reading and Math.

Although students in regular/aide classes outperformed students in regular classes, the differences were not significant. Students in aide classes maintained their small achievement advantage over students in regular classes but did not increase their advantage. There is less consistency in the aide advantage than in the small-class advantage.

Figures X-1 and X-2 present the scaled SAT scores and percentiles on Total Reading and Total Math by class type. Due to similarity of results on all subtests, the summary results presented here are confined to Total Reading and Total Math.

4. Third Grade Class-Size Effect

By grade three the pattern of results established in kindergarten had become firmly fixed. A strong class-size effect is evident in all school locations (urban, rural, inner-city, and suburban) and for all students on standardized and criterion-referenced achievement measures. The SAT scaled scores and percentiles in each of the three class types in third grade are shown for Total Reading and Total Math in Figures X-1 and X-2. The consistency of the finding of the small-class effect across all measures is important. The absence of a statistically significant teacher aide effect is consistent.

5. Summary of the Principal Analyses, Grades K-3.

A comparison of results for grades K, 1, 2 and 3 provides a picture of routine consistency. The classes of inner-city students consistently score lower on achievement measures than classes in the other three locations. (Note that most minority students and students on free lunch were in the inner-city classes). The small-class effect is extremely strong (significant $p < .001$) in all contrasts. Students benefit from small classes wherever the small classes are located.

The effect of a regular class with a full-time teacher aide on student outcomes is less powerful and consistent. There is some benefit to being in a class with a teacher aide in grade one, but that effect loses significance in other grades. A summary of the analyses showing significance levels (.05, .01, .001) is in Table X-1.

Trained and untrained teachers did equally well across all class types and the (S) advantage (and absence of Aide effect) is found equally in all four locations for trained and untrained teachers. There was no training main effect, or training-by-type interaction.

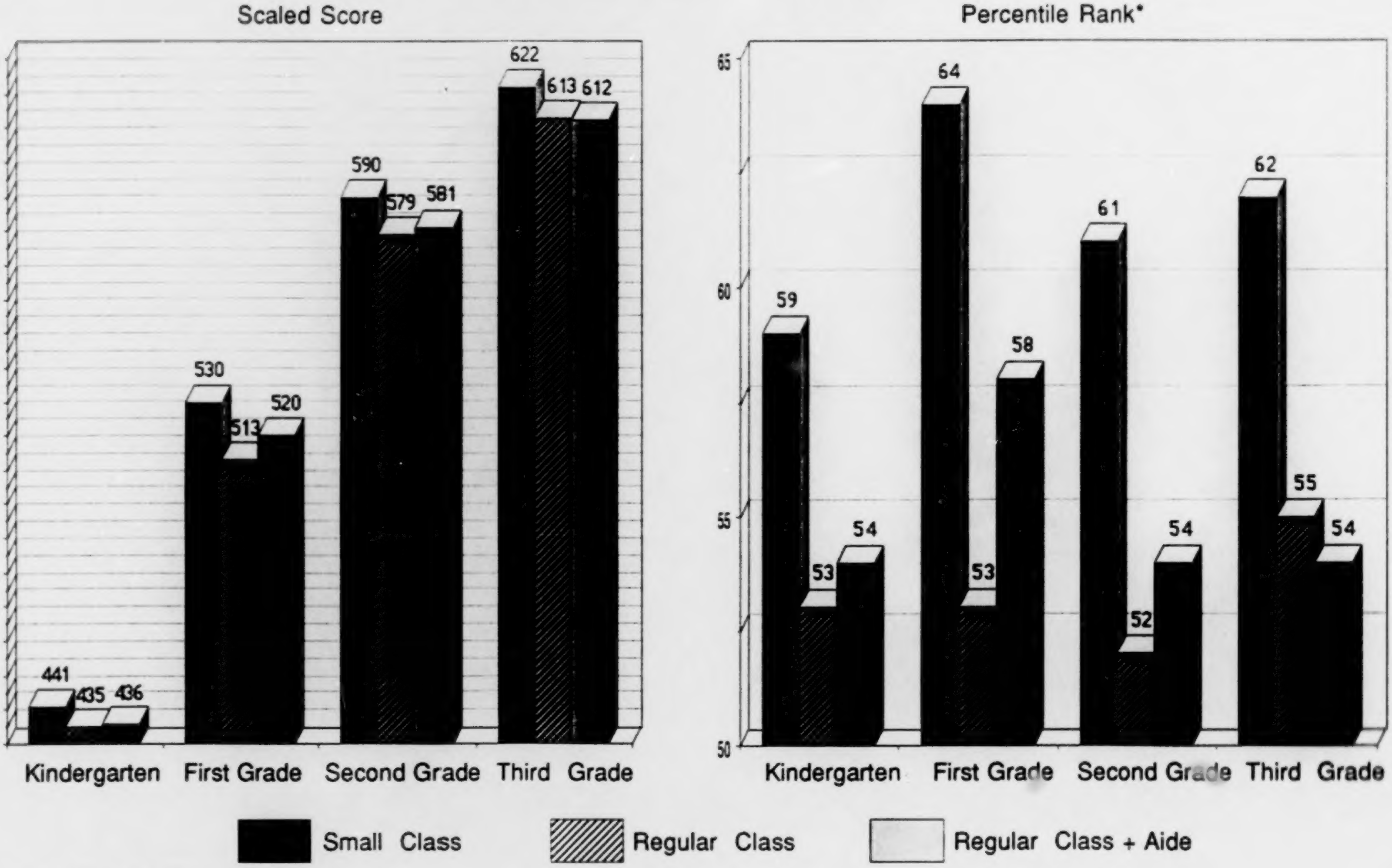
The (S) advantage and all effects found for total class generally apply equally to white and minority students, especially in grade 2. The race difference was statistically significant for all measures and multivariate sets, but not for most interactions (LxR, TRxR, TxR, LxTxR, or TRxTxR).

Figure X-1

Project STAR

Stanford Achievement Test

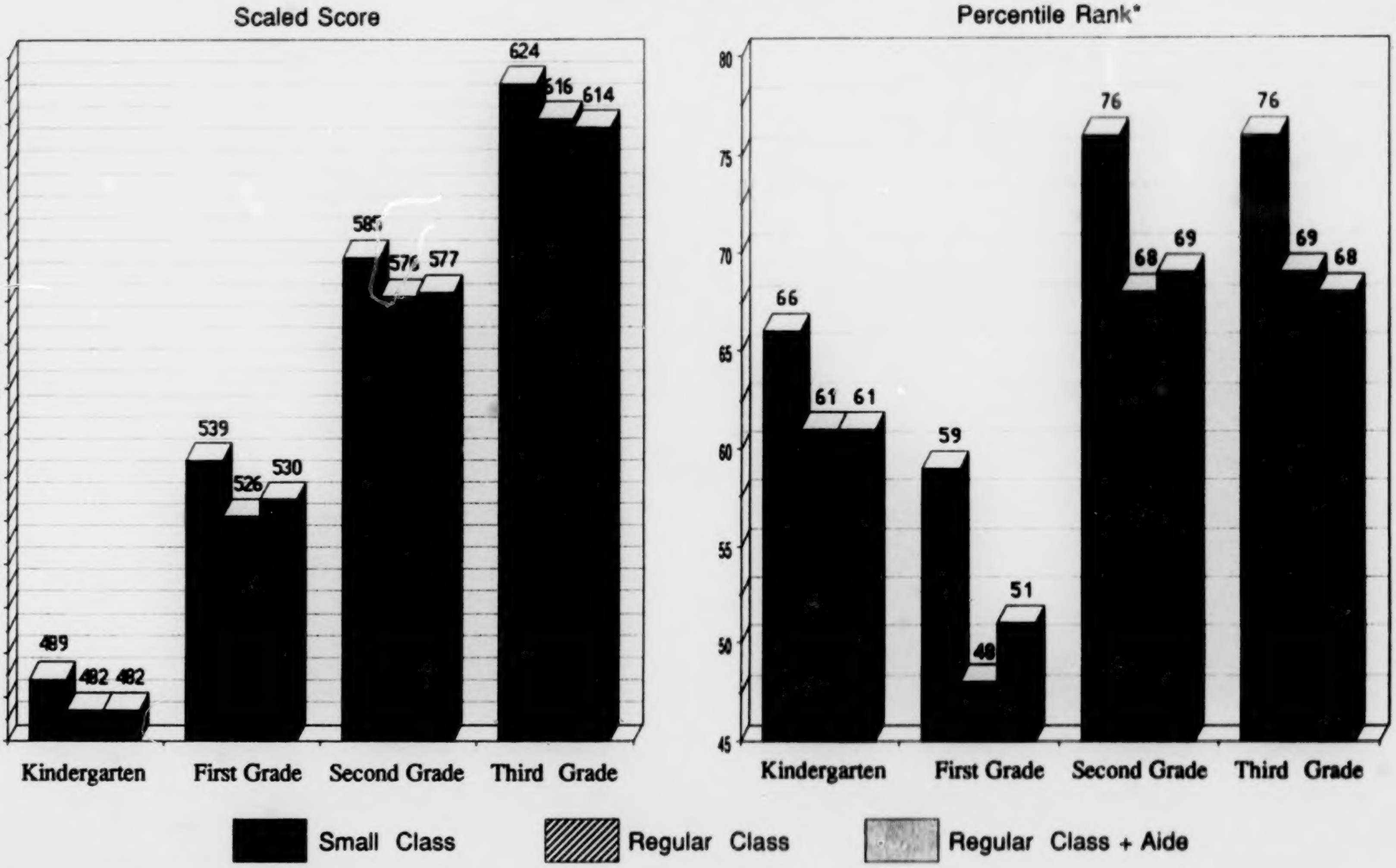
Total Reading: Class Type by Grade



Stanford SESAT II, Primary I, II, and III

*Percentile rank is based on Stanford Multilevel Norms

Figure X-2
Project STAR
Stanford Achievement Test
Total Math: Class Type by Grade



Stanford SESAT II, Primary I, II, and III

*Percentile rank is based on Stanford Multilevel Norms

TABLE X-1

Analysis of Variance for Cognitive Outcomes, STAR, Grades 1, 2, & 3 (preliminary), Sig. Levels p<=.05 or greater are Tabled. (All levels are <=.)

		Reading			Mathematics		
Effect/[a]	Grade	Multi-variate[b]	SAT Read	BSF Read	Multi-variate[b]	SAT Math	BSF Math
Location (L)	K	.01	.02	N/A	.01	.05	N/A
	1	.01	.06		.05		
	2	.001	.001	.001		.001	.001
	3	.001	.001	.001	.001	.001	.001
Race (R)	1	.001	.001	.001	.001	.001	.001
	2	.001	.001	.001	.001	.001	.001
Type (T)	K	.05	.001	N/A	.05	.02	N/A
	1	.001	.001	.001	.001	.001	.05
	2	.001	.001	.05	.001	.001	.05
	3	.001	.001	.001	.001	.001	.001
Train (TR)	2						
Loc X Race	1	.05	.05				
	2						
Loc X Type	K						
	1	All N/S. The class-size effect is found equally in all locations--Inner City, Suburban, Urban, and Rural schools.					
	2						
	3						
Race X Type	1	.05	.05	.01			
	2						
LxRxT	1	.05	.01				
	2						
LxTRxT	2	.05	.01	.05	.05	.05	.01

NOTE: Only statistically significant (<=.05) results are shown. [a]The nonorthagonal design required tests in several orders (Finn and Bock, 1985). Results were obtained as follows: each main effect was tested eliminating both other main effects; Loc x race tested eliminating main effects and loc x type; loc x type tested eliminating main effects and loc x race; race x type tested eliminating main effects and other two-way interactions, and loc x race x type tested eliminating all else (Finn and Achilles, 1989). [b]Obtained from F-approximation from Wilks' likelihood ratio. Essentially, no statistically significant differences were obtained on the self-concept and/or motivation (SCAMIN) measures.

6. Longitudinal Achievement Results

Although each yearly analysis continued to identify the benefits of a student's being in a small class, the results for the small (about 33 percent) subsample of students in the same class size for 2 years (K-1) and 3 years (1-3) showed that the small class effect does not have a continuing cumulative effect after the large gains in K and in grade 1. The results showed that the large and statistically significant gains favoring the small classes made in the first year (i.e., K in the K-1 comparison and Grade 1 in the 1-3 comparison) were still evident in later years, but that there were no statistically significant gains in future years.

The average scores on measures of achievement used for the longitudinal analyses showed that the minority students in small classes achieved higher scores than minority students in the other class conditions, but the non-minority students continued to outperform the minority students in all class types and locations.

Combining year-by-year and longitudinal results suggests that 1) a student's achievement and development are greatly improved if the student is in a small class, 2) the small-class experience is more successful if in K or Grade 1, and 3) small-class condition gains remains in the small-class condition.

C. Summary of Non-Cognitive Results

Being in a small class did not have an impact on student self-concept and motivation as measured by the SCAMIN. Students in the inner city had somewhat higher self-concept scores than students in the other locations. Self-concept measurement of young children is difficult and results may become more stable in later years.

Students in small classes in kindergarten had significantly higher self-concept scores but not higher academic motivation scores. Classes effective in improving achievement measures are not necessarily effective in achieving positive non-cognitive results ($X^2=11.71$, $p<.05$, df2). There are positive ($p<.05$) relationships between each of the achievement measures and self-concept but not between achievement measures and the non-cognitive measure of achievement motivation.

The self-concept (SCAMIN) results in grade one generally were not significant based upon class size, but there was a statistically significant result based upon school location with inner-city students scoring higher than students for other locations. Essentially the pattern of results (with minor variation) found for the SCAMIN results in kindergarten and grades two and three.

Approximately 77 percent of the small-class average scores in first grade were some higher (not significantly) than the regular or regular/aide class average scores on the self-concept measures (SCAMIN). Thus, the conclusion is that self-concept was the same for students in small classes, regular with full-time teacher aide classes and in regular classes. In second grade self-concept and motivation differences as measured by SCAMIN results tended to be minimal and non-significant, but students in the inner city (primarily minority students) continued to have higher self-concept scores than did students in the other three locations.

In third grade the differences in SCAMIN results by location were considerably more marked than in K, 1 and 2 and showed that the inner-city students had significantly higher scores than did the students in classes in the other three locations. There is no significant class-size effect for SCAMIN results; students in all three class types score about the same wherever the classes were located. By grade three, inner-city students had higher self-concepts and motivation scores as shown on the SCAMIN. The inner-city students were predominantly minority in the STAR database.

D. Summary of Achievement Results Based on Effect Sizes*

1. Students in small classes have higher performance than regular and regular/aide classes in all locations and at every grade level.

Each of the four years, small-class students in both reading and math (as well as in other SAT subtests) achieved significantly higher test scores than students in regular classes. Figure X-3 shows these differences expressed as effect sizes, for both reading and math. Small classes were constantly higher in performance.

There was a significant positive small-class effect for both reading and math at the end of kindergarten, the effect increased at Grade 1, then declined in Grades 2 and 3. Analysis of grade-to-grade gains showed that score gains in the first grade were about 15 percent larger in small classes than in regular classes, but that after the first grade, gains for both reading and math were as large, or slightly larger in regular classes as in small classes.

2. Small-class effects diminish after first grade

The small-class effect is concentrated in kindergarten and Grade 1. Thereafter the small-class effect declines slightly, but is still significant at the end of Grade 3.

This finding suggests that class size reduction should be concentrated in kindergarten and Grade 1, where effects will be greatest. This reasoning is confirmed by an analysis of the class size effect for new students who entered the project each year. The new entrants to the project allow class size effects each year to be compared with the cumulative effects for students who have been in the project from the beginning. The effect size for new students is about the same in reading in kindergarten and Grade 1, declines slightly in Grade 2, and is very small at Grade 3. For math, the class size effect is highest at Grade 1, not significant at Grade 2, and is fairly similar for kindergarten and Grade 3.

New student effect sizes also suggest that small classes should be concentrated in kindergarten and Grade 1. Effect sizes for the continuing students are always larger than the effect sizes for the new students, which is to be expected, because continuing students have had the benefit of the small class for more than one year. The effect size "advantage" of the continuing students over the new students averaged over math and reading is at approximately the same level in Grades 1, 2, and 3. This also indicates that there is no additional class size effect after Grade 1.

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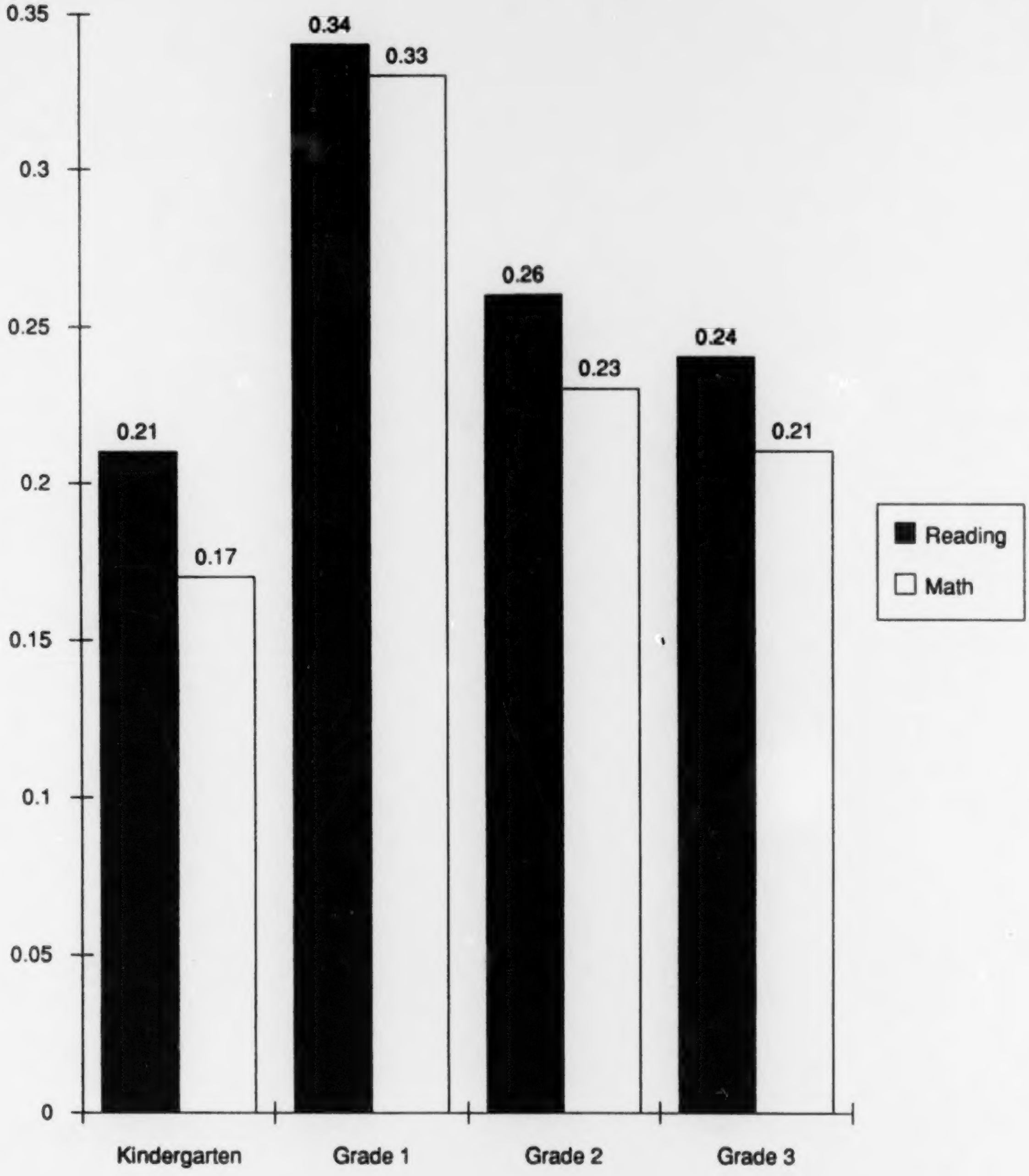
*Results reported here are based upon analyses conducted by Dr. John Folger, Vanderbilt University. Dr. Folger employed slightly different decision rules in selecting a sample for analysis from the STAR database. For example, as there were no differences between student performance in classes of trained and untrained teachers, Dr. Folger retained the classes of trained teachers; the primary analysis excluded them. The parallel analyses were confirmatory; they produced essentially identical results.

FIGURE X-3

Effect Sizes by Grade,
Small Classes Compared to Regular Classes, K-3



There are numerous possible explanation for larger effects in kindergarten and Grade 1, one is that it is more difficult to manage students who are not well socialized to the classroom routines. By the time children get to the second and third grades, they are better socialized, and the teacher can manage a larger group effectively. Another is that one year in a small class may serve to get a student "on track" or "up to speed" and subsequent years don't add to this benefits. This explanation would be similar to results obtained in the Reading Recovery projects. (See Figure X-4).

3. Aides were less effective than small classes in enhancing student performance at each grade level.

Classes with a full-time aide had higher achievement scores than regular classes in kindergarten through grade two but the differences were small and not statistically significant in kindergarten and second grade. In grade three the regular/aide classes' scores were slightly lower than the regular classes. In the first grade, aide classes were significantly higher than regular classes in both reading and math.

In grades one, two and three regular classes had the part-time services of Basic Skills aides; on the average they were available to each regular class about 25-33 percent of the time. The basic comparison is between a regular class with one-fourth to one-third time services of an aide, and a class with a full-time aide.

Aides performed a wide variety of clerical, custodial, and instructional tasks. The pattern of aide activities was not related to student achievement. Aides who performed mostly instructional tasks did not enhance student achievement any more than aides who did only clerical tasks. Appendix H provides an in-depth look at teacher aide activities and their effect on student achievement.

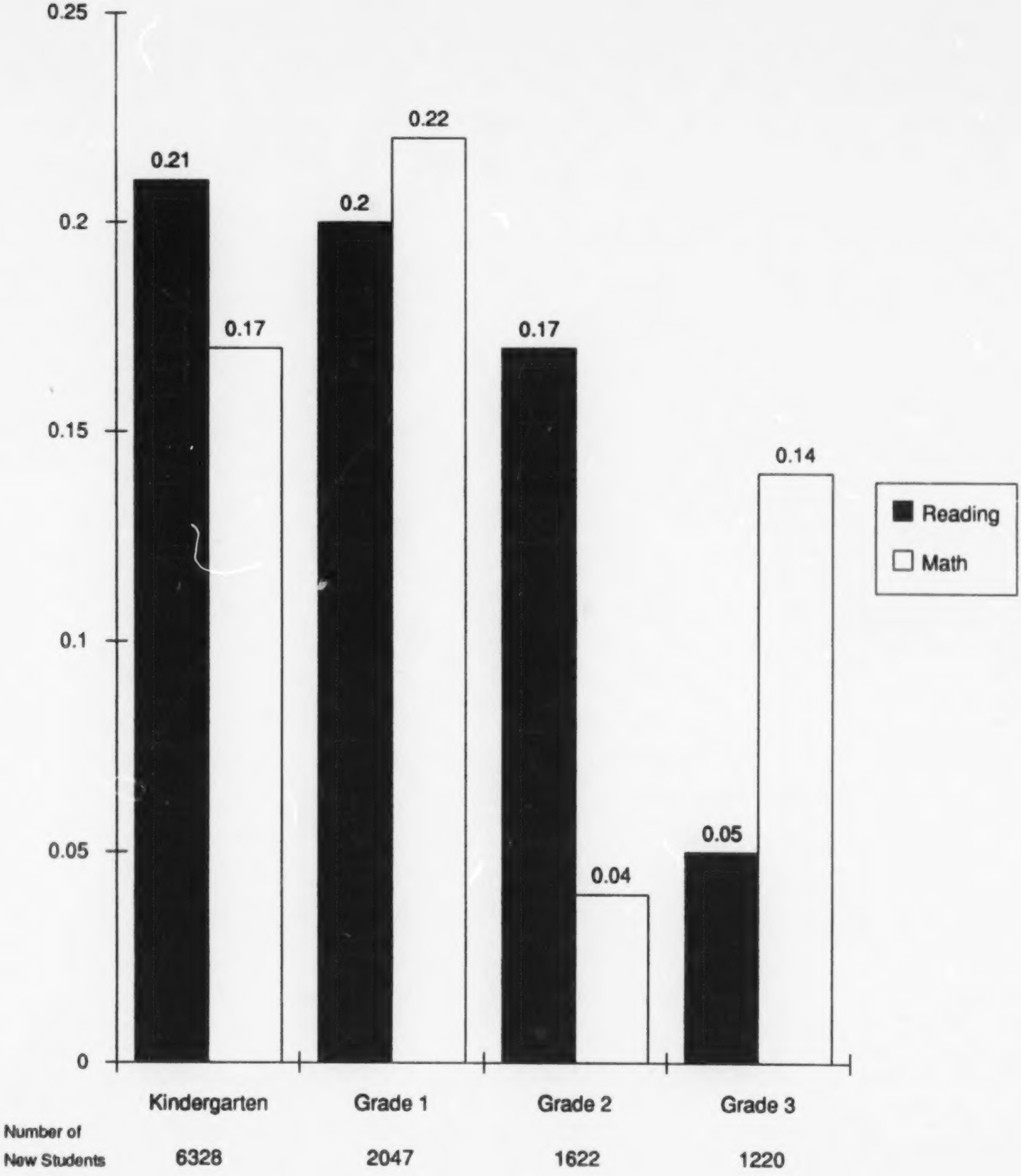
Teachers liked teacher aides. In a forced choice, about 45 percent of teachers who had an aide preferred an aide to a small class, and 55 percent favored the small class, but the bottom line is that teacher aides did not have much effect on student learning in Project STAR.

4. Math and reading effects are similar.

In a meta analysis of well controlled studies Glass (1984) estimated the **average** effect size for reading was .11, and for math it was .22 (reduction in size of 43 percent, from 35 to 20). The Project STAR effect size (averaged over four years) is .26 for reading, and .23 for math. Glass speculates that reading effects are smaller because reading instruction is done in small groups, where the overall size of the class makes less difference. Math instruction, on the other hand, is done whole group, and class size makes more of a difference. Glass's explanation did not fit Project STAR, where nearly all teachers used small groups for reading instruction but math instruction was almost all whole class. Project STAR found that class-size reduction had similar effects for all of the SAT subtests; it did not have differential effects in different subjects. Effect sizes in Project STAR were larger than those found in other well controlled studies. Slavin (1986) estimated an average effect size for smaller classes of .13, about half the Project STAR effect size. Since more positive effects of small classes have been reported for early elementary grades (Robinson, 1990), Project STAR's larger effect sizes may be because it was limited to Kindergarten through Grade 3.

FIGURE X-4

Effect Sizes for New Students Entering Project STAR Each Year for Reading and Math



5. Small classes help low socioeconomic student achievement, but they help high SES student achievement about as much.

In reading at each grade level, effect sizes for low SES students exceeded those for high SES students. At Grade 2 the difference was substantial (see Table X-2). In math, by contrast, effect sizes for high SES students exceeded those for low SES students except at Grade 2 where they were about the same.

Table X-2

Effect Sizes for Small Classes by Grade, SES, and Achievement Level Reading and Math

Test and Group	Small-Regular Effect Size			
	Kindergarten	Grade 1	Grade 2	Grade 3
Reading				
All	.21	.34	.26	.24
High SES	.19	.32	.20	.21
Low SES	.23	.35	.33	.25
Bottom quartile, previous year	---	.26	.12	.12
Math				
All	.17	.33	.23	.21
High SES	.20	.34	.21	.20
Low SES	.14	.30	.22	.18
Bottom quartile, previous year	—	.09	.25	.23

Low socioeconomic students scored lower than high SES students on the average, but there were many exceptions. To study the effect of small classes on low academic achievers, the scores of students in the bottom quartile were compared to their scores at the end of the next year to determine if a small class helped them more than a regular class.

The effect sizes for the lower quartile students were below the overall effect sizes for reading at each grade, and for math at Grade 1. At Grades 2 and 3 math effect sizes were about the same for the lower quartile and all students (see Table X-2).

These results indicate that there is no differential effect of a small class that favors low achieving or low SES students over average students or high SES students. The class size effect is "across the board" for all students.

E. Small classes reduce grade retention.

A smaller percent of students in small classes are retained each year than students in regular classes. Since grade retention has been shown by previous research (Shepard and Smith 1989, CPRE, 1990) to reduce students' chances of graduating, compared to equal ability students who are not retained, this is an advantage of small classes. Teachers were more willing to promote marginal students in small classes. Over the four years of Project STAR, 19.8 percent of the small-class students were retained, as compared with 27.4 percent of students in regular classes. Seven and one-half percent fewer students had to repeat a grade in the small classes, this would mean about a two percent a year reduction in cost per grade. It could also save costs later because promoted students have a greater chance of completing school, and avoiding delinquency and unemployment.

F. Teacher in-service training did not improve student achievement.

One of the reasons offered in the literature for class size not making a difference is that teachers do not change the way they teach when they have a smaller class (Robinson and Wittebols, 1986). Project STAR specified that there should be training for teachers, so a subgroup of 57 teachers in thirteen randomly selected schools in Grade 2 , and another 57 teachers in the same schools in Grade 3 were given three days of in-service training before school started. The training was designed to help them to teach more effectively in whatever class type they had been randomly assigned to teach. There were not significant differences in student achievement in reading or math in either the second or third grade between classes where the teachers were trained and all the other classes where the teachers had not received special training. (See Table X-3)

TABLE X-3

Stanford Achievement Test Scaled Score Gains in Reading and Math for Students in Classes where Teachers were Trained or Not Trained in STAR Training Program

	Total Reading		Total Math	
	Trained	Not Trained	Trained	Not Trained
Grade Two	58.6	58.2	46.5	45.3
Grade Three	25.7	27.4	31.9	34.1

In exit interviews at the end of the year, about half the STAR trained second grade teachers said they had not modified their teaching as a result of the training. It is not surprising that the training program did not lead to improved student performance under these conditions. Although the statistical finding for differences in teacher behavior between class sizes and for trained and untrained teachers were not strong, many valuable findings emerged:

1. If instructional goals are to increase the development of higher-order thinking skills, creativity, and personal responsibility for learning, a reduced teacher/student ratio may be important to enable teachers to achieve these objectives effectively. Fewer rote tasks, more reading and writing in context, more problem-solving activities-- all will require more teacher/student interaction than the present curriculum. If such broad changes in learning outcomes are desired, changing class size and training teachers alone will not be enough; these changes must be coupled with a curriculum focused on these objectives.

2. Teachers with small classes must be willing to receive training and be committed to try new skills and procedures.

3. Training should include effective in-service that provides:

a. time for teachers to visit other teachers who have had success in teaching small classes and

b. training in the following skills:

(1) Ability to establish effective communication with the home.

(2) Ability to involve the family in the education of their children.

(3) Ability to make home visits that will be made during in-service time or during school time with a substitute provided.

4. This improvement effort must be encouraged and strongly reinforced by principals, local system supervisors, and state department personnel.

G. Although the reduction of class size or the presence of a full-time aide caused minimal changes in instructional practices, it did produce a more effective execution of existing practices.

Project STAR data supports the view that the fundamental organization of classroom instruction is not affected by significant reduction in class size or addition of a full-time teacher aide. However, small class and aide teachers in the year-end interviews indicated that they were able to use a wider range and amount of enrichment activities than were teachers in regular classes. This is an important possibility that could not be examined by the achievement testing, because the enrichment activities are not likely to be reflected in test data.

Based on four years of interviews, patterns emerged in kindergarten and continued through the third grade. The following advantages were apparent for instruction in small and regular/aide classes:

1. basic instruction was completed more quickly, providing more time for covering additional basic material,

2. use of supplemental text and enrichment activities,

3. more in-depth instruction regarding the basic content,

4. more frequent opportunities for children to engage in first-hand learning activities using concrete materials,

5. increased use of learning centers and

6. increased use of highly desirable primary grade practices.

Improved individualization of instruction emerged as a dominant theme in small and regular/aide class teachers' perceptions. Teachers reported: 1) increased monitoring of student behavior and learning, 2) opportunities for more immediate and more individualized reteaching or enrichment, 3) more frequent interactions with each child, 4) a better match between each child's ability and the instructional opportunities provided, 5) a more detailed knowledge of each child's needs as a learner, and 6) the necessary time to meet individual learner's needs using a variety of instructional approaches. Significant reduction of class size or the addition of a full-time teacher aide also made positive changes in the physical, social, and emotional environments in primary grade classrooms. Classrooms were more pleasant work environments for both teachers and students. Teachers and students were under less stress, and learning occurred in a more relaxed atmosphere. Students were less likely to get lost in the crowd and were more likely to have their own unique needs met by adults who had a good understanding of them as individuals. The extent to which teachers, aides, and children were friendly, supportive, and trusting of one another was an indicator of the classroom morale and the sense of team spirit that is characteristic of effective elementary schools.

The teachers' perceptions of the value of small class size can be seen in the third grade teachers' choices of a small class, a full-time aide, or a salary increase (see Table X-4 and Table X-5).

TABLE X-4

Preferred Teaching Situation Of Small, Regular, and Regular/Full-Time Aide Teachers

	CLASS TYPE							
TEACHER PREFERENCE	SMALL		REGULAR		REGULAR/AIDE		TOTAL	
SMALL CLASS	88	(81%)	29	(71%)	46	(56%)	**163**	**(71%)**
REGULAR/AIDE CLASS	20	(19%)	12	(29%)	36	(44%)	**68**	**(29%)**
TOTAL	**108**	**(100%)**	**41**	**(100%)**	**82**	**(100%)**	**231**	**(100%)**

TABLE X-5

Teachers Preference for a Small Class or a Salary Increase

	CLASS TYPE							
TEACHER PREFERENCE	SMALL		REGULAR		REGULAR/AIDE		TOTAL	
SMALL CLASS	73	(70%)	22	(48%)	52	(63%)	**147**	**(63%)**
$2,500 SALARY INCREASE	32	(30%)	24	(52%)	31	(37%)	**87**	**(37%)**
TOTAL	**105**	**(100%)**	**46**	**(100%)**	**83**	**(100%)**	**234**	**(100%)**

H. Although reducing class size is more expensive than adding a full-time teacher aide, it is more cost effective.

The cost of reducing class size by one third is primarily the additional salary cost of adding teachers, and the capital costs for new classrooms that must be added. Reducing class size from 23:1 to 16:1 statewide in K-3 would require about 175-180 million dollars in additional operating expenses. If we assume that 20% of these classes are available in schools now, the additional capital costs would be 21-25 million each year amortized over 30 years for a total annual cost of 196-205 million. The need for additional classrooms could be eliminated by the implementation of year round schools. Reducing class size just in K and 1 would cost a little less than half the total (kindergarten is about 10% smaller than Grade 1) or about a 100 million dollars. It would add about 30-32 percent to the current cost per student. Adding a full-time aide in Grades K-3 would add about 75 million dollars, if the aide were only added in Grade 1 where the only aide effect was found, the cost would be about 19-20 million dollars.

If a reduction in class size is to be done in phases the program should begin in grade one with classes of 1 to 15 because that is where the greatest small-class effect was found and where the cost effectiveness would be greater. Small classes will have the greatest cost effectiveness when teachers use those teaching practices best suited for small classes. A small class provides an opportunity to do things better and differently and break out of the "more of the same" mindset. Teachers can use new teaching strategies. Home visits and increased involvement of adults or parents in the education of their children, team learning strategies, individual programming (and remediation) for each student, improved screening for physical and learning disabilities are all possible with small (1:15) classes. Small classes may be seen as a minimum foundation program which will allow variations or additions previously desired but untried due to excessive "case loads" for classroom teachers. These types of changes may require extensive training and practice before substantial benefits are achieved. The Star training program pointed out the need for more in-service with a new approach.

I. Estimates of the Magnitudes of the Differences (Grades K,I,2,3)

One important question in this study was "How large are any small class and regular with teacher-aide class advantages?" The magnitude of difference begins to get at the policy questions upon which this study was founded and to explore the educational significance of the statistically significant results obtained.

The "small-class" advantage is evident; it increases in K and 1 and decreases thereafter. Gains realized in K and Grade 1 remain evident, but decreased in grades 2 and 3. The teacher-aide advantage, like the small-class advantage, is most pronounced in grade 1 and it declined thereafter. There is no important teacher-aide advantage in K.

There is a consistent and fairly large scaled score difference favoring the small class over the regular class at each grade (approximately 10-12 in Total reading and 8-11 in math). This difference is also reflected in the higher percent of BSF criterion-referenced test items answered correctly by students in the small-class condition. These results are summarized in Tables X-6 and X-7 for the differences in performance of white and minority and all students in small and regular classes for the SAT Total Reading and Total Math (K-3) and the percent passing difference on the BSF (1-3; no K test). The SAT differences are effect sizes; the BSF are percents.

Table X-6

Summary of Estimates of Small Class Effect Sizes on Total Reading and Total Math, Grades K-3 Project STAR, 1985-1989.

	Group	Kindergarten	Grade 1	Grade 2	Grade 3
Total Reading	White	.18	.25	.19	.17
	Minority	.25	.52	.42	.32
	ALL	.21	.34	.26	.24
Total Mathematics	White	.20	.25	.19	.17
	Minority	.09	.38	.27	.22
	ALL	.15	.33	.23	.21

TABLE X-7

Differences in Average Percent Passing BSF Test of Reading and Math Between Small Classes and Other STAR Classes, Grades 1, 2, and 3

	Group	Grade 1	Grade 2	Grade 3
BSF - Reading	White	4.8%	1.6%	4.0%
	Minority	17.3%	12.7%	9.3%
	ALL	9.6%	6.9%	7.2%
BSF - Mathematics	White	3.1%	1.2%	4.4%
	Minority	7.0%	9.9%	8.3%
	ALL	5.9%	4.7%	6.7%

J. Conclusions

The design and magnitude of Tennessee's randomized class size experiment (STAR) allow researchers to make, with high levels of confidence, statements about class-size effects. Here are some examples from prior reports. "This research leaves no doubt that small classes have an advantage over larger classes in reading and mathematics in the early primary grades" (Finn and Achilles, 1989:21). "This experiment yields an unambiguous answer to the question of the existence of a class-size effect, as well as estimates of the magnitudes of the effect for early primary grades" (p.22). "These data confirm that a small-class effect, while not immense, is found in two basic subject areas, at four grade levels, and in all four school settings...Few, if any, other classroom-level interventions have been identified that have a consistent impact of this sort" (Finn, et al., 1989: 15-16).

Appendix A.

Legislation

House Bill NO. 544

By Bill Cobb

Substituted for: Senate Bill No. 799

By Lewis

An act to amend Tennessee Code Annotated, Title 49, Chapter 3, relative to incentives for class size reductions.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF TENNESSEE:

SECTION 1. Tennessee Code Annotated, Title 49, Chapter 3, is amended by adding a new Part 4, as follows:

49-3-401. In order to study the effects of reduced pupil-teacher ratio on the achievement of students in public schools, there is hereby created a demonstration project in which demonstration centers are established in varied environments across Tennessee, to be staffed as set out in this part.

49-3-402. The demonstration centers shall be established and operated under guidelines recommended by the commissioner of education and approved by the state board of education. The guidelines shall include, but not be limited to the following:

(1) Demonstration centers, to be operated by the local boards of education, shall be established in inner city schools, in urban schools, in suburban schools, and in rural schools.

(2) Demonstration centers shall be established in the three grand divisions of the state of Tennessee.

(3) Every class in the teacher/pupil ratio demonstration project shall have a maximum enrollment of seventeen (17); if the enrollment should decrease below 13 through loss of students, additional pupils may be added at the beginning of each six weeks grading period to bring the enrollment up to thirteen (13).

(4) Different models may be authorized to study and measure the relative effects of providing planning teachers, staff development programs for teachers, the use of teachers aides, the use of teachers with various levels of training and experience and other concepts approved by the board.

49-3-403. Approximately two hundred (200) teaching positions, as determined by the commissioner of education, shall be utilized and funded in the demonstration centers. All cost for these teacher shall be borne by the state department of education, including the local salary supplement otherwise required by law to be paid from local funds, but not including fringe benefits to other teachers in the local school system are entitled. Every teacher in a demonstration project under this part shall receive the same compensation, given his training, experience, and certification, as he would otherwise receive as a regular teacher, in the local school system. No demonstration teacher shall receive less instructional support and supplies than teachers not in demonstration projects at the same grade level in the same school system. The local education agencies participating in the demonstration shall provide space for the projects.

49-3-404. Five percent (5%) of the total appropriation for the demonstration project shall be allocated to the department of education for administrative costs. The commissioner of education may allocate to every local school system participating in this demonstration project an amount not exceeding five percent (5%) of the cost of the center for such system for administrative costs incurred in operating the center.

49-3-405. The purpose of the demonstration project created by this part is to make a longitudinal study of the relative effects of reduced pupil-teacher ratio on the achievement of pupils in accordance with the goals set by the general assembly in Section 49-5-5023. To this end all demonstration centers for the 1985-1986 school year shall be for kindergarten pupils. In the 1986-1987 school year, the demonstration centers shall be for these same pupils in the second grade, and in 1988-1989 for these same pupils in the third grade. The guidelines authorized by 49-3-402 may include provisions for the addition of pupils in to demonstration classes so that a teacher/pupil ratio as specified by this act may be maintained during the second and third years of the demonstration project. The study authorized herein may include the identification of a control group of pupils in the same school system for purposes of measuring differences in achievement and development of pupils in the demonstration center classes. The state department of education shall submit a plan for evaluating achievement of students to the state board of education for its approval and will implement the evaluation program in accordance with the adopted plan. The evaluation plan shall encompass the goals established by the general assembly in Section 49-5-5023. The state board of education shall submit to the general assembly annual reports of each project year and a final report of the results of the demonstration project.

49-3-406. Local school officials and employees shall assist the commissioner and state board of education in the study and reports provided in 49-3-405.

49-3-407. The teachers in the teacher/pupil ratio demonstration projects shall receive in-service training regarding effective ways to instruct students in small classes. The state department of education shall submit a teacher training plan to the state board of education for its approval and will implement the teacher training program in accordance with the adopted plan.

SECTION 2. This Act shall be implemented to the extent provided by funds annually appropriated for fiscal year 1985-1986, 1986-1987, 1987-1988, 1988-1989.

SECTION 3. This Act shall be implemented within the limits and provisions set out in the general appropriations Act.

SECTION 4. This Act shall take effect July 1, 1985, except that for purposes of developing guidelines it shall take effect on becoming law, the public welfare requiring it.

Appendix B.

Review of Literature

To date, there have been inconclusive and conflicting findings relative to research on class size. Some studies have supported smaller class size while others have not. Reviewers have found the literature complex and incomprehensible. Some reviewers have become pessimistic about the value of smaller classes. Previous reviews have described the limitations of past studies of class size and explained how research in the area depicted the problem as interactive -- a function of student characteristics, teacher characteristics and quality of teaching, subject matter taught, etc. (Cahen et al., 1979).

A 1975 Teacher Opinion Poll conducted by the National Education Association indicated that lowering class size was named by more teachers than any other item as the one improvement that would create better teacher morale and job satisfaction. It is the opinion of teachers that smaller classes mean that student attitudes toward learning and motivation are more positive resulting in higher academic achievement (Hallinan, et al., 1985).

In addition Filby et al., (1980) found that teacher attitudes in smaller classes were those of being able to get to a child and help him/her when he/she needed help; in larger classes the teachers felt that they could not get there to help. These teachers stated that their work load was heavy, with large class assignments. Such overloading decreased as smaller classes became a reality, and as a result, the teachers were able to relax more, feel less frustrated, and were able to create a more positive climate which discouraged disruptions within the classroom (Filby et al., 1980).

In this same study by Filby et al. (1980), there was a conclusion that class size reductions do not alone necessarily bring about change. However, teachers experience a relief, and this relief brings about greater enthusiasm on the part of the teacher. Such enthusiasm can lead to changes which benefit everyone. Teachers usually do what they are inclined to do anyway; however, smaller classes allow them to do a better job (Filby et al., 1980).

Empirical research has not produced consistent results regarding the relationship between class size and student achievement in spite of the amount of research that has addressed this question. In 1978 the Educational Research Services published a review of 41 studies of the effects of class size on achievement, concluding that reducing class size alone would not increase student achievement. In classes of 25-34 students at the primary level, the studies show some support for the hypothesis that smaller classes are related to higher achievement in reading and mathematics, particularly if the students are socially or economically disadvantaged or remain in small classes for at least two years (ERS, 1978).

Robinson and Wittebols suggest a Related Cluster Analysis approach designed to: (1) identify and summarize all of the research studies available on the effects of class size, and (2) group the research findings into clusters related to each of several major areas in which problems, issues, and decisions relating to class size are likely to occur. The advantages of this approach, according to Robinson and Wittebols, are that it sorts out from the large body of research findings on class size those findings that relate directly to specific areas and it makes the research understandable and useful for application to specific decisions. It differs from the Smith and Glass Meta-Analysis in that Meta-Analysis removes decision makers from familiarity with the research by giving them only broad generalizations (Robinson et al., 1986).

Class size is among the most thoroughly researched topics in public education. Over 250 separate studies dealt with class size by 1950. Since that time related research has increased proportionately. Often cited as the beginning of the most recent era of class size research, Howard V. Blake's 1954 inquiry analyzed the literature on class size prior to 1950. From the 267 reports located, he chose 85 of those based on original research which dealt with elementary and secondary school students. Of these 85 studies, 35 indicated that small classes were better, 18 indicated that large classes were better, and 32 did not support either conclusion. In further analyzing these studies, Blake established criteria to test their scientific acceptability: scientific control adequacy of sample, adequacy of measurement of the independent variable, adequacy of criterion variable measurement, rigorousness of data examined and appropriateness of the conclusions. Only 22 of the 85 previously acceptable studies met these minimum requirements. Of these, 16 favored small classes, 3 favored large classes, and 3 were inconclusive (Robinson et al., 1986).

The first meta-analysis by Glass, Cahen, and Smith (1978) dealt with the impact of class size on student achievement. By combining 77 studies which yielded 725 comparisons of achievement in classes of different sizes, they were able to spot trends that did not show up clearly in every study. Glass, Cahen, and Smith (1978) summarized their findings in these words:

> As class size increases, achievement decreases. A pupil who would score at about the 63rd percentile on a national test when taught individually, would score at about the 37th percentile (when taught) in a class of 40 pupils. The difference in being taught in a class of 20 versus a class of 40 is an advantage of ten percentile ranks.

An important outcome of the Glass/Smith meta-analysis was the finding that the greatest gains in achievement occurred among students who were taught in classes of 15 students or less. Prior to Glass/Smith, several studies were conducted relative to class size and student achievement.

A follow-up study by the Far West Laboratory for Educational Research and Development using "meta-analysis" was published in 1979. Non-achievement effects on class size such as effects on students, effects on teachers, and effects on the instructional environment and processes were investigated. The results indicated that decreasing class size had a beneficial effect on the classroom environment. In the review, class size was shown to have a more "substantial effect" on teachers than on students or the instructional environment. The effect of class size was more significant for students below the age of twelve (Smith et al., 1979).

In trying to assess the effects of class size on 76 third-grade classes in Iowa cities with a population of 5,000 or more, Herbert F. Spitzer studied data from scores of the 1953 administration of the **Iowa Every-Pupil Tests of Basic Skills**. This test measured four areas of achievement: reading comprehension, study skills, language skills, and arithmetic skills. Spitzer defined a "small" class as one containing 26 or fewer students and a "large" class as one containing 30 or more. Spitzer concluded that class size was not a factor in achievement (Spitzer, 1954).

Orlando F. Furno and George J. Collins conducted a five-year longitudinal study on the effect of class size on the reading and arithmetic achievement of a cohort group of 16,449 Baltimore City Public School students who were tested at the end of grade 3 in Spring 1960. Class size ranges of 1-25, 26-31, 32-37, and 38 or more were established for analysis. Their research was cross-classified by student IQ score, occupation of the mother, whether the student was enrolled in the regular curriculum or the special education curriculum, and the student's race. Six variables were controlled:

- number of different home addresses of the child
- highest grade obtained by the father (or in his absence, the mother)
- reading score (computed from projected and actual test scores)
- average percent of non-white faculty in schools attended by each child
- Baltimore teachers examination score
- teachers' years of experience

Furno and Collins found that smaller classes translated into reading and arithmetic achievement gains. Comparisons were made for smaller and larger classes in the regular and special education curricula. The ratio of comparisons favoring smaller to larger classes was 3.4 to 1 in the regular curriculum and 12.7 to 1 in the special education curriculum. The smaller classes (1-25) were favored 7.3 to 1 over the larger (26 or more) in 192 comparisons; in 96 comparisons involving non-white students, the ratio increased 21.3 to 1 (Furno et al., 1967).

The Cleveland, Ohio Public Schools conducted a three-year longitudinal study in two elementary buildings. The "More Effective Schools Program" was designed to improve achievement of disadvantaged inner-city students by "reorganizing organizational and instructional patterns across grade levels." Ultimately, "individualization of instruction" was to be increased by reducing class size to no greater than twenty-five, increasing instructional staff, equipment and materials, in-service training, and parent involvement. . Forty-eight percent of the teachers surveyed through a questionnaire felt the most valuable aspect of the program was small class size. For the first two years of the study, the students in the two target schools demonstrated higher achievement than the control students. In the third year, overall achievement gains were not as great (Taylor et al., 1972).

Irving H. Balow conducted a three-year longitudinal study concerned with the effects of class size on reading achievement in the Riverside, California School District. The sample of children remained constant from grades 1-4. The experimental group was comprised of 656 children, and the control group 602 children. "Small" classes were limited to 15 children and "large" classes contained 30 children. Results were obtained from scores on the Metropolitan Readiness Tests (grade 1), California Short Form Test of Mental Maturity (grade 2), Metropolitan Achievement Test (grades 2-3), and School and College Aptitude Test (grade 4). Balow found that class size influenced achievement rates when students were in small classes for two or more consecutive years. He determined that small classes were crucial to reading achievement in first grade but by third grade, class size was not the determining factor in achievement (Ballow, 1969).

Lynne M. Johnson and her associates at the South Carolina Department of Education (1978) conducted a pilot program whose purpose was to explore:

- the effect of class size on the reading and mathematics achievement of first grade students
- the effect of teacher in-service training on the reading and mathematics achievement of first grade students
- the effect of the interaction of class size and teacher in-service training on the reading and mathematics achievement of first-grade students

Fifty project classes in 23 of the state's 92 public school districts formed the basis for the data analysis. There were 25 pairs of classes matched on the student body's racial composition, socioeconomic status, and the school curriculum. The experimental classes averaged 19.9 students while the control classes averaged 26.7 students. Results of the study indicated that smaller classes significantly affected the reading and overall achievement of the first grades sampled while the differences in the mathematics achievement was so small that they might have resulted from chance alone (Johnson et al., 1978).

Wagner tested reading achievement for second graders in two schools in three large classes of more than 25 and five small classes of 15 or less. The one-year study used the Metropolitan Achievement Test and Spache Diagnostic Reading Scales to measure achievement. The smaller classes scored significantly higher in all areas of reading skills. Students in smaller classes also scored about five months higher in global reading skills and eight months higher in oral reading comprehension and word identification (Wagner, 1981).

Educational Research Service published findings in 1980 on the effects of class size on student achievement. In these findings, increases in percentile rank achievement was in direct proportion to class size reductions. For example, in a class of forty the average percentile rank was approximately forty-five, in a class of thirty there was a upward trend tendency to fifty, in a class of twenty the percentile was approximately sixty, and classes of less than twenty showed even more dramatic increases (ERS, 1980).

Cahen Filby, McCutcheon, and Kyle did a case study of the early primary grades involving quantitative measures and qualitative observation of the mid-year reduction of classes in the second grade in a rural Virginia and an urban California school. The Virginia classes were reduced from 19 to 13 students and the California classes from 35 to 22 students. The achievement tests from the Beginning Teacher Evaluation Study were used with the results that a large percentage of students in the reduced classes scored higher on the post-testing than had been predicted by the pre-testing. In addition, the classes in the Virginia school advanced further through their textbooks than was "usual" for the years prior to the study (Cahen et al., 1983).

Sindelar et al. found that small group size tends to improve achievement of students because there is maximization of those variables which relate to achievement. One of these variables is what Fisher calls "substantive teacher interacting," and is defined as "presentation of information on academic content, monitoring of work, and feedback about performance." It is suggested that this interaction encourages student "engaged time" and such time is related to the achievement of students. The smaller the class size, the greater the opportunity for "substantive teacher interaction." (Sindelar et al., 1984)

A statewide reduction of classes in grades K-3 was the result of pilot data from the Indiana State Department of Education (1983). The 1981-83 study compared reading and mathematics achievement of 24 K-3 classes at a ratio of 14:1 to K-3 classes averaging 23 students. Standardized reading and math test scores showed that students in the "small" classes exceeded normal growth in greater numbers than comparable students in the "large" classes. Generally, 14 percent more students in smaller classes exceeded the expected achievement than students in larger classes. Teachers also saw improvements in the behavior of students, increased productivity, and more hands-on participatory learning (ISDPI, 1983).

Filby et al. found that the attention rates for students increased as class size decreased. The range of those paying attention was from 56 percent in large classes to 72 percent in the smaller classes. Increased attention span meant less time waiting for help or causing disturbances in the classroom (Filby et al., 1980).

The Better Schools Program was initiated in Tennessee on July 1, 1984 by Governor Lamar Alexander. One component of this program was the Tennessee State University Center for Excellence in the Teaching of Basic Skills to Economically and Educationally Disadvantaged Students. Edward H. Whittington (1984) studied the effects of class size (1:15) on the teaching/learning process in grade one. The experimental group consisted of 105 first grade students divided into seven classes of 15 students each. The control group consisted of 90 students divided among three and one-half teachers with a class size of 25 students each. The blind control group was comprised of 105 students drawn from 35 elementary schools, matched with the experimental group demographically according to five pre-established criteria: (a) sex, (b) race, (c) economic status, (d) date of birth within 45 days, and (e) total pre-reading raw score within four point on the California Achievement Test Level 10. The statistical analysis of pre- and post-test results indicated that the experimental group consistently achieved better results than either control group. The only intervening variable was the reduction of class size from 1:25 to 1:15. Therefore, it was concluded that reducing class size to 1:15 has a positive effect on student reading and math outcomes (Whittington, 1985).

The second year results (1986) of the study in Nashville, Tennessee yielded different results. Ben D. Dennis studied the effects of small class size (1:15) on the teaching/ learning process in grade two. Dennis reported no difference between the groups (experimental, control, and blind) on learning achievement. He cites several possible reasons for this finding, among them:

> (1) Anxiety and pressure among teachers statewide because of the use of a new achievement test (Stanford Primary II)
> (2) Anxiety and pressure among the experimental group students because of the use of a new achievement test
> (3) Different test administration procedures from school to school . . .
> (4) First grade students possibly achieving more in small classes than second grade students (Dennis, 1986).

An earlier study (1964) in New York City had similar results to Dennis. The More Effective Schools (MES) program, originating in 10 elementary schools in 1964 and enlarged to 11 more schools the following year, sought to improve educational quality by focusing on integration, heterogeneous grouping, team teaching, and community-school relations. Class size did not exceed 22 students. The report of this program states that "the MES program has made no significant difference in the functioning of children, whether this was measured by observers rating what children did in class, or how they do it, or whether it was measured by children's ability in mathematics or reading on standardized tests." (Fox, 1967)

The results of the San Francisco South East Education Development Project (1970) were that class size did not significantly relate to the monthly reading achievement rates of disadvantaged, primarily black, first grade classes (Counelis, 1970).

Little and others (1971) investigated the reading achievement of eight-year-olds in the Inner London Education Authority. Small but significant differences were seen in reading between classes of 40 or more and classes of 30 or less, favoring the larger classes. This relationship was constant, even when school racial or immigration status and social class were controlled. The factor that revealed the largest reading gap was the absence or presence of a "stimulating" home environment (Little et al., 1971).

Murnane (1975) reported that class size had no influence on achievement in either reading or mathematics in a study involving 875 inner-city black children in grades 2 and 3. All students in the study were in classes of less than 28 and the researcher believed that the insufficient variation in class sizes may account for this finding. Murnane noted, however, that although arguments against class size reduction often stress minimal impact of small classes on achievement, small classes may influence teachers' morale enough to keep them from leaving the profession over seemingly trying working conditions. Thus, a student's future achievement may be positively affected by having a "superior, experienced" teacher (Murnane, 1975).

Teacher morale is often perceived to be more positive as class size decreases. The Virginia Beach Class-Load Relief Model was designed to provide reliable data about program impact upon student achievement and attitude and teacher morale. Using a weighted factor, a true teacher load was determined by analyzing the composition of a class according to categories devised by a Class Size Committee. A class of 25, for example, could have a load factor of 40 or even higher, depending upon the nature and concentration of instructional problems identified by the teacher.

The experimental groups consisted of 137 fourth grade students and 64 eighth graders and the control group was comprised of 136 fourth grade students and 42 eighth graders. The results of this study were that attitudes of the experimental teachers and students were basically the same even though the elementary and secondary experimental teachers perceived that their morale was more positive. For student achievement, the program did not appear to have increased student performance. Elementary students, who did or did not participate in the program, appeared to achieve at an equal rate. Secondary students who participated in the program were achieving at or below secondary students who had not been in the program (Carrington et al., 1982).

Research has begun to focus upon what actually happens in smaller classes as opposed to larger ones. The Ministry of Education in Ontario, Canada, was concerned with this question in a two-year study. Students from the fourth grade were assigned, in the first year, to some thirty-four different classes--some with sixteen students, some with twenty-three, some with thirty, and some with thirty-seven. During the second year they were all reassigned to different sized classes. This allowed the researchers to study the same students and the same teachers in different settings and to observe changes in classroom processes. The overall findings indicated that even though class size did not change the degree of individualized instruction, the teacher did spend up to twice as much time per student in the reduced size classes (Klein, 1985).

Over the years findings from class size research have drawn contradictory conclusions about the positive effects of reduced class size on student achievement. In fact, there has been major controversy over these findings. Notably, the attack on the Glass and Smith meta-analysis results by Robinson and Wittebols. Robinson and Wittebols objected that the Glass and Smith findings, which showed a positive relationship between reduced class size and student achievement, were not reliable because the meta-analysis had included college classrooms and individual tutoring arrangements. However, when Robinson and Wittebols did a cluster analysis by grade level they concluded that smaller classes were beneficial in the early primary grades.

The most recent comprehensive review, meticulously conducted by the California Educational Research Cooperative, has concluded:

> For all student populations, class size research, while difficult to synthesize offers convincing evidence of an important link between lowered student/teacher ratios and higher achievement (Mitchell, et al., 1989).

Findings from the current major well-designed class size studies, seem to have influenced policy makers toward the institution of reduced class size. Ernest L. Boyer, president of the Carnegie Foundation for the Advancement of Teaching, has laid out a four-point plan to ensure that all children are educated to their full potential, which includes reducing classes to "no more than 15 students per teacher" for the early elementary grades. In addition, the National Association of Elementary School Principals (NAESP) Delegate Assembly has revised their class size policy statement from 20 to 1 down to recommending a student-teacher ratio of 15 to 1."

The Review of Literature was compiled by Jayne Zaharias from the doctoral works of Ben Dennis, Jane Eldridge, Roseanne Jacobs, and Mary Parks.

Appendix C.

Data Processing Issues

Project STAR, "a watershed event of research", is the largest class size study that has been conducted. From 1985 through 1989 STAR researchers collected data on students and school personnel in 79 elementary schools across the state of Tennessee. Data relevant to school staff including principals, teachers, and teacher aides amounted to over 1,500 cases per year utilizing 12 different data collection instruments. Testing and demographic data were collected on students who entered these schools as kindergartners (1985-86), first graders (1986-87), second graders (1987-88), and third graders (1988-89). Over the course of Project STAR, this student data resulted in over 10,000 cases. The Project STAR data base was a monumental and challenging task for its managers.

The consortium of four universities located in East (University of Tennessee, Knoxville), West (Memphis State University), and Middle Tennessee (Tennessee State University and Vanderbilt University) was formed in the summer of 1985 and was responsible for selecting and/or designing the STAR data collection instruments. Each university designated a principal investigator (PI) to collaborate as a member of the consortium. These PIs were also responsible for the collection of data in the schools located in their particular region of the state.

The consortium selected/designed 12 instruments for collecting school staff information. At the end of the kindergarten year, the need for an experienced data base manager was obvious. In order to provide consistency, the manager, Dr. Baqar Husaini, changed the format of the 12 instruments to allow for a systematic coding scheme. This coding scheme included color coding, by printing each form on a different color of paper, and reformatting so that identification variables (e.g., identification numbers, school type, class type, etc.) would appear in the same place on each form. A brief description of each form and any additional modifications for a particular form are as follows:

1. Demographic Profiles

a. School and System Profile- In order to get an overall picture of each school, principals completed this form which asked for such variables as school enrollment, average daily attendance, average daily membership, and Chapter I eligibility. It also called for the percentage of students on free lunch, the percentage of students bussed, a breakdown of students by race, total system expenditure per student and system enrollment.

b. Principal Profile provided demographics on the individual principals, i.e. sex, race, education, experience, etc.

c. Teacher Profile provided background information which included the teacher's school and level of education, certification, amount of teaching experience, type of in-service training completed, etc. It also provided the teacher's sex and race. In kindergarten the "in-service" variable was collected in an open-ended format. Compilation of this variable became time consuming, and therefore, it was changed to a categorical variable in first grade and remained so throughout the project.

d. Aide Profile provided information on full-time STAR teacher aides which included education, experience, teaching experience, certification, sex, and race. The collection of the teacher aide's "education" was slightly modified from kindergarten to first grade. In kindergarten it was noted whether or not the aide had an associate degree. From first grade through the end of the project, aides were asked only to report the number of years spent in college, if they did not have a bachelor's degree.

In addition to any specific modifications reported for individual profiles, the principal, teacher, and teacher aide profiles originally collected the "date of birth" of these persons. This variable was viewed as unnecessary by the consortium and thus was not collected after the kindergarten year.

2. Instruments Used by Teachers to Report Classroom Characteristics

a. The Teacher Log recorded the time spent on typical daily activities which included routine paper work, student activities, small group, whole group, and individualized instruction, planning and preparation time, and personal time. In the kindergarten year the log attempted to collect this information in an "open-ended" format. This format made it virtually impossible to organize and code variables to allow application of a statistical treatment. Vanderbilt University developed a coding scheme. Unfortunately it was extremely complicated and time-consuming and left much room for error. In fact, applying this process took approximately an hour per instrument. After coding several of the logs, a random selection were keyed and analyzed. No results were found. The consortium decided this process was expensive, time-consuming, and not worthwhile and, therefore, abandoned it. Thus, kindergarten teacher log data is basically useless at this point. In addition to the new systematic coding scheme, the log was completely redesigned. For grades 1 through 3 the log was structured to provide time slots in 15 minute increments (from 7:30 a.m. to 4:30 p.m.). It included specific activity codes (e.g., planning, whole group instruction, personal time, etc.) and subject codes (i.e., reading, math, other) for the teacher to fill into the appropriate time slot. Therefore, the log data are easily accessible for first, second, and third grade.

b. The Grouping Questionnaire recorded the number of small groups that teachers created within their classes for instruction in reading, math, science, and social science. The average number of minutes spent each week in small group instruction and the criteria used for assigning students to instructional groups were also identified. In kindergarten the consortium sent this form to project schools without a teacher identification variable. It was time-consuming, but the data base team was able to trace the identity of most of the teachers by comparing the return envelopes, which identified the school, to the school design, and by comparing teachers' handwriting from previously collected forms, and through numerous telephone calls. The systematic coding scheme, applied to the instruments after the kindergarten year, solved this problem for grades one through three.

c. The Parent/Volunteer/Teacher Interaction Questionnaire provided the number of times during a four-week period that teachers communicated with parents about the performance or behavior of students or about general classroom activities. Modes of interaction included in-person, by phone, or written contact. The quantity and quality of interaction were also noted. Additionally, teachers recorded the type and number of times during a four-week period that assistance was received from a "volunteer" or Basic Skills First (BSF) teacher aide. As was the case with the grouping questionnaire, this instrument was sent to the schools in kindergarten without identification variables. The data base team used the same tracing procedures (described in item b. above) which fortunately resulted in identifying the majority of these forms. Originally, this instrument was named "Parent/Teacher Interaction Questionnaire." In second grade it was revised to include questions reflecting the use of teacher aides and was renamed "Parent/Volunteer/Teacher Interaction Questionnaire." Unfortunately, all of the Memphis State University schools and one Tennessee State University school received the original version of this form in second grade. Thus, data collected on this instrument in second grade exists in two separate data files: (1) Parent/Volunteer/Teacher Interaction (N=225) and (2) Parent/Teacher Interaction (N=115).

d. The Teacher Problem Checklist indicated the frequency and extent to which teachers were bothered by 61 problems they might encounter. The problems related to their responsibilities to students, their relationships with staff, administrators, and parents, the use of their time, and their professional growth. This instrument was devised by Donald Cruickshank of Ohio State University. The STAR consortium used it in its original form with the exception of adding 1 question (see Figure 8, item 61). This form was collected as a pre/post-measurement for first, second, and third grade. Again, in kindergarten, the consortium members returned these forms to the data base with no identification variables. These forms were traced by comparing the class type variable with return envelopes.

e. The Special Programs Form identified students who left their classes to participate in special programs such as Chapter I, Special Education, Language Development, Gifted, etc. The average amount of time students spent each week in these programs was also recorded. In kindergarten and first grade this instrument was sent to project teachers in an "open-ended" format. The data base team was responsible for the time-consuming task of interpretation and coding. In second and third grade, instructions for coding were included with the instrument.

f. The Exit Interview called for an "in-person" interview with each teacher at the end of the school year. These interviews allowed the teacher to describe the advantages and disadvantages of teaching a small class or teaching with a full-time aide. The kindergarten interview was unstructured and designed in an "open-ended" format. Based upon a synthesis of the kindergarten results, the researchers developed a more highly structured interview format for subsequent years.

3. Instruments used by STAR Teacher Aides to Report Classroom Characteristics

a. The Aide Log provided information about the amount of time full-time aides spent on various generalized categories of activities during a typical day. The activity and subject codes are the same as those described for the Teacher Log (see item 2-a). In addition the Aide Log underwent the same revisions as the Teacher Log.

b. The Aide Questionnaire provided information about the full-time aide's interaction with their assigned Project STAR teacher. In addition, the specific types of daily tasks (e.g., bus duty, lunch duty, teaching lessons) and the amount of time spent on these tasks were reported. This information was collected in kindergarten and was never used by the researchers. The decision was made not to collect it in first grade. In second grade the consortium revised the form without consulting the data base team. Data collected on the revised questionnaires had to transferred to a form which made accurate key punching possible. A revised form was developed for third grade with coding that permitted key punching.

The twelve instruments described above in items 1, 2, and 3 are shown in their final modified form in Figures 1 through 12. Parties interested in seeing these data collection instruments as they appeared for each year of the project should contact the Assistant Commissioner of Curriculum and Instruction, Tennessee State Department of Education, Cordell Hull Building, Fourth Floor, North, Nashville, Tennessee, 37219-5338.

4. Instruments Used to Provide Student Demographic, Achievement and Self-Concept Data

a. The Roster was collected each fall to provide researchers with each student's full name, identification ID number, sex, race, and date of birth. In the spring, before the end of each school year, rosters were used to collect attendance, promotion, and free lunch status. The ID numbers on kindergarten and first grade rosters were eleven-digit birth certificate numbers. Because all students did not have readily available birth certificate numbers, a decision was made by the state to begin using nine-digit social security numbers. Project STAR got caught in the middle of this new procedure. In second and third grade, a nine digit social security number was used or a nine digit, Project-generated, unique ID number was produced by turning the eleven-digit birth certificate number into a nine-digit number by eliminating the first two digits of the birth certificate number. The data base team had to match kindergarten and first grade students to their new ID's by comparing names, birthdays, sex, and race. This was extremely time-consuming, but fortunately the majority of students were traced and merged into the longitudinal file.

b. Stanford Achievement Test (SAT) - Students were tested each spring at the dates specified by the state for testing. In each grade, the appropriate level of SAT was administered to all Project STAR students and to students in 21 comparison schools. In kindergarten the SESAT II version was used because it covered more material and thus had a higher ceiling and could measure additional learning. The Primary I was given for first grade, the Primary II for second grade, and the Primary III for third grade. The SESAT II test tape was provided to the STAR data processing staff with **no identification numbers**. Student names from SESAT II had to be matched with names from the rosters, in order to assign them a correct identification number which would allow these test scores to become part of the comprehensive data base. This was a very complex and time-consuming job. The Primary I had coding space for only a nine-digit ID number. Teachers and monitors were instructed to drop the first two digits of the eleven-digit birth certificate number for coding. However, this was not made clear to some teachers and monitors, who chose to drop two zeros or the last two digits. Again the data base team went through a lengthy and complex procedure of matching students. By the time the Primary II and III tests were administered, teachers and monitors were more familiar with STAR identification numbers and coding procedures. Therefore fewer cases had to be matched, and the matching process was improved.

c. Tennessee Basic Skills First (BSF) - Since the Stanford Achievement Test did not cover all of the curriculum taught, and the curriculum did not cover everything tested by the SAT, Project STAR contracted with the state testing service to develop criterion tests in reading and math for first and second grade. These tests were designed to be similar to the already developed third grade BSF test. The BSF learning objectives were criterion tested. The tests consisted of multiple choice items with four items per objective. They were untimed tests but were designed to be administered in about an hour. Matching problems similar to those discussed for the SAT (item b) occurred due to coding space for only nine digits for the student identification number. Since other descriptors were available (e.g., student name, school identification, etc.) most cases were matched.

d. Self-Concept and Motivation Inventory - In addition to the SAT and BSF tests, students completed a self-concept and motivation inventory (SCAMIN). The SCAMIN asked students to indicate pictorially their response to 24 situations. For example what "face" (i.e., happy, sad, indifferent, etc.) would the students wear if they had to tell their parents they lost their coat. The SCAMIN was selected because it is group administered, has forms appropriate for grades K-3, measures elements of self-concept of concern to the project, and requires no special training for administration. While it has only moderate reliability for the early grades, it may be useful for comparing groups, such as small classes with regular classes. (See Davis, Johnston, et al. for further information.) The SCAMIN created a great deal of difficulty for the data base staff. Test monitors were never used for administration of the SCAMIN. In kindergarten the only identification variables were school, date of birth and sex. The fact that there was no student identification number or name made "matching" for this instrument a very intricate process. Due to multiple duplications of the descriptive variables (i.e., school, date of birth, and sex) many cases were lost. In first through third grade the consortium decided to place the student ID in the space intended for the school ID. Although this improved matching to a degree, many incorrect identification numbers were still coded and many cases were lost.

5. Recommendations for Data Processing

When conducting an enormous study such as Project STAR, unforeseen problems are to be expected . As the saying goes, "Hindsight is better than foresight," and this section is not intended as a critique of the STAR study or its staff but rather as a guideline or warning for future research of this magnitude. The following recommendations are based on problems encountered by the data base team during the study.

An experienced data base manager should be hired prior to any data collection. This person should be seen as equal to a PI(s). Hopefully, this would eliminate the problem of data being collected in a haphazard manner (i.e., without appropriate descriptors, or on forms that cannot be key punched, etc.)

Students in the project supposedly had unique identification numbers (IDs) by means of a birth certificate (BC) number or social security (SS) number. The fact that these were composed of a different number of digits (BC=ll and SS=9) combined with the problem of a limited coding space on necessary forms created major tracking problems for the data processing staff. To alleviate this, all forms requiring student ID numbers (e.g., test answer sheets) should be reviewed simultaneously and in advance of collecting the desired information to determine a maximum coding space for the number. Once this is determined a totally unique set of IDs should be generated especially for the research study.

Newly created data collection forms should be pilot tested to ensure reliability and validity. If all the researchers are satisfied with the results of the pilot tests, it is suggested that forms not be modified. This would help to assess longitudinal effects.

In addition to these three main suggestions, a general guideline for any research project would be to allow enough time for flexibility in the data processing schedule to deal with unexpected problems when they arise. Of course every research study will have its own unique obstacles and this section is not intended to address detailed problems. Hopefully the suggestions presented here will be of some benefit to future research projects.

6. Recommendations for Additional Analyses

Tennessee is probably one of very few states in possession of an educational research data base the size of Project STAR's. The STAR researchers have investigated many interesting facets of class size and, in addition, several doctoral dissertations have utilized the STAR data. Yet there are still many questions that could be posed and answered from this vast data base. The following paragraphs discuss some of these options.

Due to time constraints principal investigators had to choose a limited number of subscores from the SATs to measure the effects of class size on student achievement. These were the total reading, total math, total language, total listening, and word study skills scores. Remaining subscores such as reading comprehension, concepts of numbers, science and social studies could be analyzed to measure further class size effects or to possibly explain the finding that small class teachers reported spending less time teaching reading than regular or regular/aide teachers. It could be assumed that the small class teachers had time to teach subjects measured by these additional subscores. If small classes showed greater achievement in these areas, it would substantiate this assumption.

In addition to subscores which have not been examined, Content Cluster Performance Categories from the SATs could be analyzed. According to the Stanford Technical Data Report, "an analysis of performance on the various Stanford content clusters can be useful in identifying students' strengths and weaknesses in specific objectives within a content area." A comparison of these cluster scores across class types might reveal specific skills that are influenced more by small classes. Performance clusters that involve higher order thinking skills might show a larger small-class effect than other clusters in the same content area.

The BSF objective mastery scores could be used in a manner similar to the SAT cluster scores. A pass/fail score is available for each BSF objective in reading and math. The objectives could be examined to see if any single objective shows a larger small class effect than other objectives in the same content area. This type of analysis could help identify which specific skills are more influenced by the small-class effect.

The Teacher Problem Checklist was collected as a pre/post measure to assess the effects that a small class or a full-time aide might have had on alleviating typical problems experienced by teachers. Due to limited time, results from the pre/post tests have not been compared. A more thorough investigation of this data might prove to be interesting.

Three types of full-time teacher aide data were collected on the Aide Profile, Aide Questionnaire, and Aide Log (see items 1-d and 3). An in-depth look at this information could provide an answer to why some regular/aide classes outperformed small classes in isolated instances. It might also show why aides did not have an overall effect on performance of students in these classes.

Data from the Special Programs Form (see item 2-e) could provide further insight on student performance. All students who appeared on these forms at any time and who remained in the project for at least a second collection of these data could be selected as a subsample. The amount of hours spent in a special program (e.g., remedial reading) at the first collection of data could be compared to the number of hours reported on the last collection. Thus, these data could be used to find out if students in small and/or regular/aide classes progressively required less "pull-out" programs than students in regular classes.

Is homogeneous grouping, where students are assigned to classes according to their reading ability, more effective than heterogeneous grouping, where students are assigned randomly? This question might be answered by comparing STAR regular classes, in which students were randomly assigned, to the appropriate classes in the 22 project comparison schools, where homogeneous grouping occurred.

Project STAR has enough data available to produce innovative educational research for years to come. This section has presented only a few possibilities for further data analysis.

Record Type ☐ A
1
For Office Use Only

Figure C-1

PROJECT STAR
SCHOOL AND SYSTEM PROFILE

	Month	Year
Date	☐☐ 2 3	☐☐ 4 5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

School Enrollment	☐☐☐☐ 32 33 34 35	
ADA (Average Daily Attendance)	☐☐☐ 36 37 38	
ADM (Average Daily Membership)	☐☐☐ 39 40 41	
Chapter I Eligibility	☐ 42	1. Yes 2. No
% Free/Subsidized Lunch	☐☐ 43 44	
% Children Bussed	☐☐ 45 46	

% White Students	☐☐ 47 48	% Hispanic	☐☐ 53 54
% Black Students	☐☐ 49 50	% Am. Indian	☐☐ 55 56
% Asian	☐☐ 51 52	% Other	☐☐ 57 58
Grade Span	☐☐ 59 60		

ENTRY DATE INTO PROJECT STAR Month ☐☐ (61 62) Year ☐☐ (63 64)

(OVER)

School System Name ☐☐☐☐☐☐☐☐☐☐
65 66 67 68 69 70 71 72 73 74

School ID Number ☐☐☐☐☐☐☐
75 76 77 78 79 80 81

System Enrollment ☐☐☐☐☐☐
82 83 84 85 86 87

Total Expenditures per Pupil ☐☐☐☐
88 89 90 91

Location in State ☐ 1. East 2. Middle 3. West
92

Record Type C
1
For Office Use Only

Figure C-2

PROJECT STAR
PRINICPAL PROFILE

	Month		Year	
Date	☐	☐	☐	☐
	2	3	4	5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Principal's SS#	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	32	33	34	35	36	37	38	39	40	
Principal's Last Name	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	41	42	43	44	45	46	47	48	49	50

First Name ______________________________

Principal's Sex ☐ 51 1. Male 2. Female

Principal's Race ☐ 52 1. White 2. Black 3. Asian 4. Hispanic 5. Am. Indian 6. Other

---

Please write in the name of the university and it will be coded into the blocks later.

EDUCATION Degree #1 ☐ 53 1. BA/BS

College or University ☐ ☐ ☐ ☐ (54 55 56 57) ______________ Name of University

Degree #2 ☐ 58 1. M.Ed. 2. MA/MS

College or University ☐ ☐ ☐ ☐ (59 60 61 62) ______________ Name of University

Degree #3 ☐ 63 1. 2nd MA/MS 2. Ed.S. 3.Ph.D./Ed.D.

College or University ☐ ☐ ☐ ☐ (64 65 66 67) ______________ Name of University

(OVER)

Are you certified as a teacher? ☐ 68 1. Yes 2. No

Years of teaching experience (Not including any years spent as an Assistant Principal or Principal)

☐☐ 69 70 Teaching at this school

☐☐ 71 72 Total Years of Teaching

EXPERIENCE AS AN ADMINISTRATOR

Are you certified as an Administrator?

☐ 73 1. Yes 2. No

Years of Experience as an Administrator (including years as an Assistant Principal)

☐☐ 74 75 Years at this school

☐☐ 76 77 Total No. of Years

CAREER LADDER LEVEL ☐ 78

1. Not on Career Ladder
2. Pending
3. Ladder One
4. Ladder Two
5. Other________________________

ENTRY DATE INTO PROJECT STAR Month ☐☐ 79 80 Year ☐☐ 81 82

Your home address and phone number are requested in case we need to contact you. This information will not be a part of the database.

Address:____
Street

______________________________, ________ __________
City State Zip Code

Home Phone: (______)-______-________

Figure C-3

Record Type ☐ D
1
For Office Use Only

PROJECT STAR
TEACHER PROFILE

	Month		Year	
Date	☐	☐	☐	☐
	2	3	4	5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Teacher's SS#	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	32	33	34	35	36	37	38	39	40	
Teacher's Last Name	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	41	42	43	44	45	46	47	48	49	50

First Name ______________________________

Teacher's Class Type ☐ 51 — 1. Small (1-15) 2. Regular (1-25) 3. Regular w/Aide

Teacher's Sex ☐ 52 — 1. Male 2. Female

Teacher's Race ☐ 53 — 1. White 2. Black 3. Asian 4. Hispanic 5. Am. Indian 6. Other

---

Please write in the name of the university and it will be coded into the blocks later.

EDUCATION Degree #1 ☐ 54 — 1. BA/BS

College or University ☐☐☐☐ (55 56 57 58) ______________________________ Name of University

(OVER)

Degree #2 ☐ 1. M.Ed. 2. MA/MS
59

College or University ☐☐☐☐ ______________________
60 61 62 63 Name of University

Degree #3 ☐ 1. 2nd MA/MS 2. Ed.S. 3. Ph.D./Ed.D.
64

College or University ☐☐☐☐ ______________________
65 66 67 68 Name of University

Are you certified for grades 1-3? ☐ 1. Yes 2. No
69

TEACHING EXPERIENCE

Years of teaching experience completed as of July 1, 19___:

☐☐ At this grade level
70 71

☐☐ At this school
72 73

☐☐ Total no. of years
74 75

IN-SERVICE TRAINING

Which of the following types of in-service training have you completed during the past two years?

TIMS	76	1. Yes 0. No
Reading Workshop	77	
Math Workshop	78	
Classroom Management	79	
Career Ladder	80	
Taking College Courses	81	

CAREER LADDER LEVEL ☐ 82

1. Chose not to be on Career Ladder
2. Apprentice
3. Probationary
4. Level 1
5. Level 2
6. Level 3

ENTRY DATE INTO PROJECT STAR Month ☐☐ 83 84 Year ☐☐ 85 86

Your home address and phone number are requested in case we need to contact you. This information will not be a part of the database.

Address: ______________________________
Street

______________________________, ________ ________
City State Zip Code

Home Phone: (______)-______-________

Record Type E
1
For Office Use Only

Figure C-4

PROJECT STAR
AIDE PROFILE

Date: Month ☐ 2 ☐ 3 Year ☐ 4 ☐ 5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Teacher Aide's SS# ☐ 32 ☐ 33 ☐ 34 ☐ 35 ☐ 36 ☐ 37 ☐ 38 ☐ 39 ☐ 40

Teacher Aide's Last Name ☐ 41 ☐ 42 ☐ 43 ☐ 44 ☐ 45 ☐ 46 ☐ 47 ☐ 48 ☐ 49 ☐ 50

First Name ______________________________

Teacher Aide's Sex ☐ 51 1. Male 2. Female

Teacher Aide's Race ☐ 52

1. White	3. Asian	5. Am. Indian
2. Black	4. Hispanic	6. Other

EDUCATION

Have you graduated from High School or received a GED? ☐ 53 1. Yes 2. No

If you have attended college but have not received a degree, how many years of college work have you completed?

☐ 54 1, 2, 3, 4 or more years; 5=Received Degree

Please write in the name of the university and it will be coded into the blocks later.

Degree #1 ☐ 55 1. BA/BS

College or University ☐ 56 ☐ 57 ☐ 58 ☐ 59 ______________ Name of University

Degree #2 ☐ 60 1. M.Ed. 2. MA/MS

College or University ☐ 61 ☐ 62 ☐ 63 ☐ 64 ______________ Name of University

Degree #3 ☐ 65 1. 2nd MA/MS 2. Ed.S. 3.Ph.D./Ed.D.

College or University ☐ 66 ☐ 67 ☐ 68 ☐ 69 ______________ Name of University

(OVER)

Are you certified as a teacher? ☐ 70 1. Yes 2. No

Years of teaching experience ☐☐ 71 72

Years of experience as an aide at this school ☐☐ 73 74

ENTRY DATE INTO PROJECT STAR Month ☐☐ 75 76 Year ☐☐ 77 78

To which teacher are you assigned? ______________________________

Please write in the teacher's full name on the line above. The name will be coded into the boxes later. ☐☐☐☐☐☐☐☐☐☐ 79 80 81 82 83 84 85 86 87 88

Your home address and phone number are requested in case we need to contact you. This information will not be a part of the database.

Address: ____
Street

______________________________, ________ ________
City State Zip Code

Home Phone: (______)-______-________

Record Type ☐ P
1
For Office Use Only

Figure C-5

PROJECT STAR
TEACHER LOG

	Month		Year	
Date	☐	☐	☐	☐
	2	3	4	5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Teacher's SS# ☐☐☐☐☐☐☐☐☐
32 33 34 35 36 37 38 39 40

Teacher's Last Name ☐☐☐☐☐☐☐☐☐☐
41 42 43 44 45 46 47 48 49 50

First Name ______________________

Teacher's Sex ☐ 51 1. Male 2. Female

Teacher's Race ☐ 52
1. White 3. Asian 5. Am. Indian
2. Black 4. Hispanic 6. Other

Teacher's Class Type ☐ 53
1. Small (1-15) 2. Regular (1-25)
3. Regular w/Aide

Teacher's Highest Degree:

☐ 54
1. BA/BS 3. Ed.S.
2. MA/MS/M.Ed. 4. Ed.D./Ph.D.

ACTIVITY CODES

1. Routine Paperwork would include:
   A. Paperwork required by the school administration (i.e., forms, reports)
   B. STAR project forms and updates
   C. Checking or grading student paperwork

2. Routine Student Activities would include such activities as:
   A. Taking daily attendance
   B. Collecting and accounting for lunch money or other monies
   C. Bus monitoring duties
   D. Recess duty(ies)
   E. Break in routine duties (such as bathroom, assembly, etc.)

3. Whole Group Instruction suggests any activity carried on with the class; including audience situations, i.e., discussions or instructions, presentations, common new learnings (skill presentation), "open-book" textbook sessions, choral reading.

4. Small Group Instruction suggests that a group of students is pulled from the whole group to carry on with an activity. Usually all members of the small group use the same materials. Group instruction may be set up according to academic skill levels, specific needs or interests.

5. Individual Instruction suggests working with a student "one-on-one" and/or meeting the student's instructional needs on an individual basis. For example, working with one student to strengthen a skill area would be individual instruction. Monitoring and adjusting reading, math, etc. skills on an individual basis would be contract work and individualized instruction.

6. Planning and Preparation would include:
   A. Writing lesson plans
   B. Preparing necessary instructional materials or aids (bulletin boards, centers, dittos, etc.)
   C. Confering with parents, students, or educational personnel
   D. Housekeeping duties

7. Personal Time suggests any activity where a 15-minute time block is used for a personal break or personal business (i.e., a phone call to make a doctor's appointment or going to the teacher's lounge).

TYPE OF ACTIVITY I PERFORMED TODAY

Day of Mo. ☐☐ 55 56

Day of Wk. ☐ 57

Tues - 1
Wed - 2
Thurs - 3

Please write only one of the following activity codes in each time slot box and only one subject code (**WHEN APPLICABLE**) in the adjacent box.

ACTIVITY CODES:

(Activity Code Definitions are on Page 2)

1. Routine Paperwork
2. Routine Student Activity
3. Whole Group Instruction
4. Small Group Instruction
5. Individualized Instruction
6. Planning and Preparation
7. Personal Time

SUBJECT CODES:

1. Reading
2. Math
3. Other

TIME SLOT	ACTIVITY	SUBJECT
7:30 - 7:45	58	59
7:45 - 8:00	60	61
8:00 - 8:15	62	63
8:15 - 8:30	64	65
8:30 - 8:45	66	67
8:45 - 9:00	68	69
9:00 - 9:15	70	71
9:15 - 9:30	72	73
9:30 - 9:45	74	75
9:45 - 10:00	76	77
10:00 - 10:15	78	79
10:15 - 10:30	80	81
10:30 - 10:45	82	83
10:45 - 11:00	84	85
11:00 - 11:15	86	87
11:15 - 11:30	88	89
11:30 - 11:45	90	91
11:45 - 12:00	92	93
12:00 - 12:15	94	95
12:15 - 12:30	96	97
12:30 - 12:45	98	99
12:45 - 1:00	100	101
1:00 - 1:15	102	103
1:15 - 1:30	104	105
1:30 - 1:45	106	107
1:45 - 2:00	108	109
2:00 - 2:15	110	111
2:15 - 2:30	112	113
2:30 - 2:45	114	115
2:45 - 3:00	116	117
3:00 - 3:15	118	119
3:15 - 3:30	120	121
3:30 - 3:45	122	123
3:45 - 4:00	124	125
4:00 - 4:15	126	127
4:15 - 4:30	128	129

Record Type M
1
For Office Use Only

Figure C-6

PROJECT STAR
GROUPING QUESTIONNAIRE

The STAR Project is interested in the extent to which teachers in the project regularly divide children into groups for instruction. Please describe the groups you have within your class. Any groups that involve your children with children from other classes should be recorded on the Special Programs questionnaire. Thank you for your assistance.

	Month	Year
Date	☐☐ 2 3	☐☐ 4 5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Teacher's SS#	☐☐☐☐☐☐☐☐☐ 32 33 34 35 36 37 38 39 40	
Teacher's Last Name	☐☐☐☐☐☐☐☐☐☐ 41 42 43 44 45 46 47 48 49 50	
First Name	____________________	
Teacher's Class Type	☐ 51	1. Small (1-15) 2. Regular (1-25) 3. Regular w/Aide
Teacher's Sex	☐ 52	1. Male 2. Female
Teacher's Race	☐ 53	1. White 3. Asian 5. Am. Indian 2. Black 4. Hispanic 6. Other

---

1. Do you divide your students into small groups for reading instruction on a regular basis? If so, please indicate the number of groups, and the average number of minutes spent in small grouped instruction each week.

   1=Yes 2=No ☐ 54 Number of Groups ☐ 55 Average Number of Minutes per Week ☐☐☐ 56 57 58

2. Do you divide your students into small groups for mathematics instruction on a regular basis? If so, please indicate the number of groups, and the average number of minutes spent in small grouped instruction each week.

   1=Yes 2=No ☐ 59 Number of Groups ☐ 60 Average Number of Minutes per Week ☐☐☐ 61 62 63

(OVER)

3. Do you divide your students into small groups for science instruction on a regular basis? If so, please indicate the number of groups, and the average number of minutes spent in small grouped instruction each week.

1=Yes
2=No ☐ 64 Number of Groups ☐ 65 Average Number of Minutes per Week ☐ ☐ ☐ 66 67 68

4. Do you divide your students into small groups for social science instruction on a regular basis? If so, please indicate the number of groups, and the average number of minutes spent in small grouped instruction each week.

1=Yes
2=No ☐ 69 Number of Groups ☐ 70 Average Number of Minutes per Week ☐ ☐ ☐ 71 72 73

5. How do you assign the children to reading or math instructional groups? Please write a "1" in the box for yes and a "2" in the box for no.

	Reading	Math
A) By the child's skill level	☐ 74	☐ 75
B) By the child's interest	☐ 76	☐ 77

C) Other procedure(s)
If other, please specify:______________________________________

6. For Reading and Math, do you move children from one group to another during the school year? Please indicate by using:

1=Yes: Frequently (every six weeks or more often)
2=Yes: Occasionally (less than every six weeks, but at least once during the year)
3=No

A) Reading ☐ 78

B) Math ☐ 79

Record Type ☐ N
1
For Office Use Only

Figure C-7

PROJECT STAR
PARENT/VOLUNTEER/TEACHER INTERACTION QUESTIONNAIRE

Date Month ☐☐ (2 3) Year ☐☐ (4 5)

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Teacher's SS# ☐☐☐☐☐☐☐☐☐ 32 33 34 35 36 37 38 39 40

Teacher's Last Name ☐☐☐☐☐☐☐☐☐☐ 41 42 43 44 45 46 47 48 49 50

First Name ________________________________

Teacher's Class Type ☐ 51 1. Small (1-15) 2. Regular (1-25) 3. Regular w/Aide

---

PAST FULL WEEK:

Time Code: 1-9 = 01 through 09. Example: 9 times = 0 9
10 times = 1 0

1. During the past four weeks, how many times have you had a telephone conversation with a parent regarding his/her child's performance or behavior?

☐☐ 52 53

2. During the past four weeks, how many times have you written a note to a parent regarding his/her child's school performance or behavior?

☐☐ 54 55

3. During the past four weeks, how many times have you held a scheduled conference with a parent, primarily to discuss his/her child's school performance or behavior?

☐☐ 56 57

4. Please estimate how many times during the past four weeks you have had an unscheduled contact with parents of children in your classroom.

☐☐ 58 59

5. During the past four weeks, how many times have you made a professional visit to homes of your students?

☐☐
60 61

6. During the past four weeks, how many times have you sent a form letter communication home to parents, suggesting activities they should do at home with their child?

☐☐
62 63

7. During the past four weeks, how many times have you sent a newsletter home to parents to inform them of past, current, or future classroom activities, topics of study, etc.?

☐☐
64 65

8. During the past four weeks, how many times has a parent helped you with a maintenance task such as: cleaning tables, mending books or toys, fixing snacks, helping children with clothing, etc.?

☐☐
66 67

9. Please estimate during the current school year, how many professional visits you have made to homes of your students.

☐☐
68 69

10. As a whole, are you satisfied with the quality and quantity of parent interactions you have had this year? 1=Yes 2=No

☐
70

11. If you answered NO to #10, why are you dissatisfied? What will have to change for yhou to be satisfied with you interactions with parents?

12. During the past four weeks, how many times have you had a volunteer (parent/other) assisting you in your class? (Do NOT include parent volunteer help on schoolwide projects that are not directly related to your classroom, such as helping in the library or lunchroom.)

☐☐
71 72

13. During the past four weeks, how many times has a volunteer (parent/other) assisted you on each of the following tasks:

A. Clerical assistance (telephoning, checking papers, running dittos, etc.)

☐☐
73 74

B. Instructional assistance (individual tutoring, resource center work, working with small groups, etc.)

☐☐
75 76

C. Leading the entire group in a lesson

☐☐
77 78

14. During the past four weeks, how many times did you have an aide (BSF, grade level, NOT a Project STAR aide) assist your class?

☐☐
79 80

15. During the past four weeks, how many times has an aide performed the following tasks? (NOT a Project STAR aide)

A. Monitoring or supervising children at recess, lunch, etc.

☐☐
81 82

B. Assisting you in preparing materials and performing other clerical duties

☐☐
83 84

C. Assisting you in instruction

☐☐
85 86

16. How many times in the past four weeks has a special teacher (music, art, etc.) taught your class?

☐☐
87 88

THANK YOU FOR YOUR ASSISTANCE!

Figure C-8

PROJECT STAR
TEACHER PROBLEMS CHECKLIST

What grade are you currently teaching? **Month** **Year**

1=First 2=Second 3=Third 1 **Date** 2 3 4 5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Teacher's SS# 32 33 34 35 36 37 38 39 40

Teacher's Last Name 41 42 43 44 45 46 47 48 49 50

First Name ____________________

Teacher's Class Type 51 **1. Small (1-15) 2. Regular (1-25)**
3. Regular w/Aide

Teacher's Sex 52 **1. Male 2. Female**

Teacher's Race 53 **1. White 3. Asian 5. Am. Indian**
2. Black 4. Hispanic 6. Other

TEACHER PROBLEMS CHECKLIST

Donald R. Cruickshank
Ohio State University

A problem arises when we have a goal and cannot achieve it. Everyone has problems, teachers included. Some problems result from the nature of the special work of teachers. It is important for teachers, school districts, teacher organizations, and teacher educators to know what teachers' problems are so that conscious, planned efforts can be made to consider and perhaps to reduce or eliminate them.

Directions

The problems on the checklist have been reported by teachers in Tennessee and across the country. They may reflect problems you encounter. In order to find out, respond to each statement in two ways.

Example: Look at the sample problem statement below and how one teacher has responded to it. As you read this problem statement (and all others in this checklist) mentally preface the statement with the words "I have a problem . . ."

"I Have a Problem . . ."

How Frequently Does This Problem Occur?						How Bothersome Is This Problem?				
Never		Occasionally		Always		Not At All		Somewhat		Extremely
1	2	[✓ 3]	4	5	1. Creating interest in the topic being taught.	1	2	3	4	[✓ 5]

The sample problem shows that the teacher felt that "Creating interest in the topic being taught" is *Occasionally* a problem but that when it happens it is *extremely* bothersome.

You can see there are five choices related to the frequency of occurrence of the problem and five choices related to the extent of its bothersomeness, therefore many combinations are possible. Remember to place a check mark in one of the frequent columns *and* in one of the bothersome columns for *each* problem.

Please do not leave any items blank. If you feel a statement does not apply to you or your situation then it is not a problem for you, and should be marked "never" or "not at all."

DO NOT use the boxes at the side of each question. These are for office use only.

"*I Have a Problem . . .*"

How Frequently Does This Problem Occur?

How Bothersome Is This Problem?

FOR OFFICE USE ONLY		Never		Occasionally		Always		Not At All		Somewhat		Extremely
54	55	1	2	3	4	5	1. Liking my students.	1	2	3	4	5
56	57	1	2	3	4	5	2. Getting students to participate in class.	1	2	3	4	5
58	59	1	2	3	4	5	3. Maintaining order, quiet or control.	1	2	3	4	5
60	61	1	2	3	4	5	4. Improving life for my students by correcting conditions both inside and outside school.	1	2	3	4	5
62	63	1	2	3	4	5	5. Having enough free time.	1	2	3	4	5
64	65	1	2	3	4	5	6. Getting my students to feel successful in school.	1	2	3	4	5
66	67	1	2	3	4	5	7. Getting students to behave appropriately.	1	2	3	4	5
68	69	1	2	3	4	5	8. Gaining professional knowledge, skills, and attitudes and using them effectively.	1	2	3	4	5
70	71	1	2	3	4	5	9. Controlling and using my professional time in the most functional, efficient way.	1	2	3	4	5
72	73	1	2	3	4	5	10. Understanding and helping the atypical or special child.	1	2	3	4	5
74	75	1	2	3	4	5	11. Getting cooperation and support from the administration.	1	2	3	4	5
76	77	1	2	3	4	5	12. Helping students who have personal problems.	1	2	3	4	5
78	79	1	2	3	4	5	13. Keeping my students away from things and people which may be a bad influence.	1	2	3	4	5
80	81	1	2	3	4	5	14. Planning instruction in different ways and for different purposes.	1	2	3	4	5
82	82	1	2	3	4	5	15. Responding appropriately to improper behavior such as obscenities.	1	2	3	4	5

"I Have a Problem . . ."

How Frequently Does This Problem Occur?

How Bothersome Is This Problem?

FOR OFFICE USE ONLY		Never		Occasionally		Always			Not At All		Somewhat		Extremely
84	85	1	2	3	4	5	16.	Developing and maintaining student rapport, affection, and respect.	1	2	3	4	5
86	87	1	2	3	4	5	17.	Assessing my students'learning.	1	2	3	4	5
88	89	1	2	3	4	5	18.	Soliciting appropriate student behavior.	1	2	3	4	5
90	91	1	2	3	4	5	19.	Improving conditions so that students can study better at home.	1	2	3	4	5
92	93	1	2	3	4	5	20.	Having enough preparation time.	1	2	3	4	5
Card	2*												
54	55	1	2	3	4	5	21.	Extending learning beyond the classroom.	1	2	3	4	5
56	57	1	2	3	4	5	22.	Controlling aggressive student behavior.	1	2	3	4	5
58	59	1	2	3	4	5	23.	Getting my students to achieve competence in basic skills such as expressing themselves effectively in both writing and speaking.	1	2	3	4	5
60	61	1	2	3	4	5	24.	Completing the work I have planned.	1	2	3	4	5
62	63	1	2	3	4	5	25.	Promoting student self-evaluation.	1	2	3	4	5
64	65	1	2	3	4	5	26.	Getting the understanding and sustenance of teachers and administrators so that I feel efficient and professional.	1	2	3	4	5
66	67	1	2	3	4	5	27.	Helping students adjust socially or emotionally.	1	2	3	4	5
68	69	1	2	3	4	5	28.	Establishing good relationships with parents and understanding home conditions.	1	2	3	4	5
70	71	1	2	3	4	5	29.	Getting my students to value school marks and grades.	1	2	3	4	5
72	73	1	2	3	4	5	30.	Enforcing considerate treatment of property.	1	2	3	4	5
74	75	1	2	3	4	5	31.	Establishing and maintaining rapport with students and staff	1	2	3	4	5
76	77	1	2	3	4	5	32.	Helping students improve academically.	1	2	3	4	5
78	79	1	2	3	4	5	33.	Enforcing social mores and folkways such as honesty and respect for teachers.	1	2	3	4	5

"I Have a Problem . . ."

How Frequently Does This Problem Occur?

How Bothersome Is This Problem?

FOR OFFICE USE ONLY		Never		Occasionally		Always		Not At All		Somewhat		Extremely
80	81	1	2	3	4	5	34. Encouraging parental interest in school matters.	1	2	3	4	5
82	83	1	2	3	4	5	35. Having enough time to teach and also to diagnose and evaluate learning.	1	2	3	4	5
84	85	1	2	3	4	5	36. Providing for individual learning differences.	1	2	3	4	5
86	87	1	2	3	4	5	37. Getting students to use their leisure time well.	1	2	3	4	5
88	89	1	2	3	4	5	38. Getting students to enjoy learning for its own sake.	1	2	3	4	5
90	91	1	2	3	4	5	39. Avoiding duties inappropriate to my professional role.	1	2	3	4	5
92	93	1	2	3	4	5	40. Getting every student to work up to his or her ability.	1	2	3	4	5
94	95	1	2	3	4	5	41. Being professional in my relationships with staff.	1	2	3	4	5
Card 3*												
54	55	1	2	3	4	5	42. Creating interest in the topic being taught.	1	2	3	4	5
56	57	1	2	3	4	5	43. Holding worthwhile conferences with parents.	1	2	3	4	5
58	59	1	2	3	4	5	44. Having students present and on time for all classes, rehearsals, games, etc.	1	2	3	4	5
60	61	1	2	3	4	5	45. Maintaining student attention.	1	2	3	4	5
62	63	1	2	3	4	5	46. Establishing and maintaining rapport with administrators and supervisors.	1	2	3	4	5
64	65	1	2	3	4	5	47. Learning to use alternative methods of instruction.	1	2	3	4	5
66	67	1	2	3	4	5	48. Eliminating inappropriate student behavior.	1	2	3	4	5
68	69	1	2	3	4	5	49. Understanding the conditions of the homes and community in which my students live.	1	2	3	4	5
70	71	1	2	3	4	5	50. Using time wisely to get both professional and personal things accomplished.	1	2	3	4	5
72	73	1	2	3	4	5	51. Guiding my students to do the things which will help them succeed in school.	1	2	3	4	5
74	75	1	2	3	4	5	52. Removing students who are sources of frustration.	1	2	3	4	5

"I Have a Problem . . ."

How Frequently Does This Problem Occur?

How Bothersome Is This Problem?

FOR OFFICE USE ONLY		Never		Occasionally		Always		Not At All		Somewhat		Extremely
76	77	1	2	3	4	5	53. Knowing how to differentiate between student learning and psychological problems.	1	2	3	4	5
78	79	1	2	3	4	5	54. Teaching too many students or large classes.	1	2	3	4	5
80	81	1	2	3	4	5	55. Vitalizing my students' interest in learning and improving their achievement.	1	2	3	4	5
82	83	1	2	3	4	5	56. Developing confidence in my colleagues.	1	2	3	4	5
84	85	1	2	3	4	5	57. Overcoming a student's feelings of upset or frustration with himself.	1	2	3	4	5
86	87	1	2	3	4	5	58. Assisting parents having difficulty with their children.	1	2	3	4	5
88	89	1	2	3	4	5	59. Overcoming student apathy or outright dislike.	1	2	3	4	5
90	91	1	2	3	4	5	60. Teaching self-discipline.	1	2	3	4	5
92	93	1	2	3	4	5	61. Directing the work of a teacher aide or volunteer assistant.	1	2	3	4	5

eacher's Class Type ☐ 1 **Figure C-9** Date **Month** ☐ 2 ☐ 3 **Year** ☐ 4 ☐ 5

PROJECT STAR
SPECIAL PROGRAMS

Special Programs are any activities that pull some children of the same lass and combine them with children from other classes on a regular basis. An xample would be a Chapter I program that pulls children out of several classes or reading instruction. Please furnish us with a record of each student who s involved in each program and how much time he or she is pulled out each eek. DO NOT record any programs of brief duration, i.e., less than two weeks n length or programs that pull children out for less than an hour a week. If student is in more than one program, please list the child in each program. 2 record all Special Programs such as Chapter I or Special Education.

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Teacher's SS# ☐ 32 ☐ 33 ☐ 34 ☐ 35 ☐ 36 ☐ 37 ☐ 38 ☐ 39 ☐ 40

Teacher's Last Name ☐ 41 ☐ 42 ☐ 43 ☐ 44 ☐ 45 ☐ 46 ☐ 47 ☐ 48 ☐ 49 ☐ 50

STUDENT'S NAME			STUDENT ID 75-85	HOURS PER WEEK 86-87	NAME OF SPECIAL PROGRAM 88-97	PURPOSE OF SPECIAL PROGRAM
Last 54-63	First 64-73	MI 74				

Figure C-10

TEACHER EXIT INTERVIEW

NAME:______________________ CLASS TYPE:_____
SCHOOL:______________________

YEAR:______ NO. OF STUDENTS: LAST YEAR:______
THIS YEAR:______

---

1. If the amount of content covered in you class has been different this year, describe HOW and why it has been different.

1st Year Teacher - Did you cover the required content:
Yes ___ No ___ Any additional?

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:____________________

2. If the amount of instructional time on task has been different in your class this year as compared to last year, then describe HOW and why it has been different.

1st Year Teacher - Was there enough instructional time to stay on task?

Yes____ No____

TEACHER EXIT INTERVIEW

NAME:____________________ *CLASS TYPE:*____
SCHOOL:____________________

---

3. If monitoring student work in you class has been different this year as compared to last year, then describe HOW and why it has been different.

1st Year Teacher - Do you believe you effectively monitored your student's work? Yes_____ No_____ Was there adequate time?

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:____________________

---

4. If your ability to match the level of instruction to the ability of individual children has been different in your class this year as compared to last year, then describe HOW and why it has been different.

1st Year Teacher - Were you able to match the level of instruction to the ability of individual children? Yes_____ No_____

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:____________________

---

5. If there has been a difference in the pacing of instruction between this year and last year, then describe HOW and why it has been different.

1st Year Teacher - Do you believe your instructional pace was adequate for the students? Yes_____ No_____

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:__________________

---

6. Have you had more individual exchanges with students this year?

Yes_____ No_____

1st Year Teacher - Have you been satisfied with the individual exchanges you have had with your students this year? Yes_____ No_____

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____

SCHOOL:____________________

---

7. If your individual attention to students has been different this year as compared to last year, then describe HOW and why it has been different.

1st Year Teacher - Were you able to give sufficient individual attention to the students? Yes_____ No_____

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:__________________

---

8. If the social climate in your classroom has been different this year as compared to last year, then describe HOW and why it has been different.

1st Year Teacher - How would you describe the social climate in your room.

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:__________________

---

9. Did you take less paper work home this year than last year? If yes, why?

1st Year Teacher - Were you able to complete all of your paper work at school?
Yes____ No____

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:__________________

[INTERVIEWER: THIS QUESTION APPLICABLE TO REGULAR/AIDE TEACHERS ONLY]

10a. If you had to choose **one way** or the other, would you describe your use of the full-time teachers aide as:
_____primarily a clerical assistant;
or
_____ primarily an instructional assistant.

10b. How has your full-time aide been involved in instructional activities?

10c. Are there instructional tasks for which your aide is primarily responsibe? (List and describe.)

10d. What are the instructional tasks that are only the teacher's responsibility?

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:___________________

11a. Predict how your students will perform academically and socially in a regular fourth grade class next year.

11b. Please give reasons for your prediction of their strengths and weaknesses.

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:__________________

12a. Has the use of learning centers in your classroom been different this year than last year?
Yes_____ No_____

12b. If yes, how has use of learning centers differed this year?
_____more centers
_____fewer centers
_____smaller centers
_____larger centers
_____other (please describe)
_____not applicable (NA)

12c. Why do you think that there were differences in the use of learning centers in your classroom this year?
_____small class
_____aide
_____other
_____NA

Probe Points

12d. types of centers
12e. use and quality of center time
12f. use of aides related to learning centers

1st Year Teachers - Did you use learning centers?
Yes_____
How many ? _____
No_____

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:___________________

13a. Has use of enrichment activities in your class been different this year than last year?
Yes_____ No_____

13b. If yes, how has the use of enrichment activities differed this year?
- _____field trips
- _____center activities
- _____special art/music/drama
- _____creative writing
- _____invited guests
- _____cooking activities
- _____other

13c. Why do you think the use of enrichment activities has differed this year?
- _____small class
- _____aide
- _____other

Probe Points

12d. opportunities for enrichment activities
12e. use of aides related to enrichment activities

1st Year Teacher - What enrichment activities did you use this year?

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:____________________

14a. Has classroom management in your class been different this year than last? Yes_____ No_____

14b. If yes, how has classroom management been different this year?
_____reward systems
_____student contracts or conferences
_____behavior modification techniques
_____other

14c. Why do you think classroom management was different this year?
_____small class
_____aide
_____other

Probe Points

14d. use of behavior modification

1st Year Teacher - Do you feel your classroom management is adequate? If no, why not?

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:__________________

15a. Have parent/teacher relations been different in your class this year than last year? Yes_____ No_____

15b. If yes, how have parent/teacher relations differed this year?
_____more parent involvement
_____less parent involvement
_____parents performed clerical duties
_____parents worked with children in small groups
_____parents worked with children individually
_____more communication with parents
_____other

15c. Why do you think parent/teacher relations differed this year?
_____small class
_____aide
_____parents had more time available
_____parents had less time available
_____other

Probe Points

15d. use of parents in classroom
15e. frequency and type of communication with parents
15f. problems working with parents

1st Year Teacher - How have the parents been involved in your room this year?

TEACHER EXIT INTERVIEW

NAME:____________________ CLASS TYPE:____
SCHOOL:__________________

---

16. If your had your choice, which teaching situation would you choose:

_____ a small class with 15 children

OR

_____ a regular class with 25 children with a full-time aide ?

17. If your had your choice, which teaching situation would you choose:

_____ a small class with 15 children

OR

_____ a $2,500.00 salary increase?

Figure C-11

Record Type Q
1
For Office Use Only

PROJECT STAR
AIDE LOG

	Month		Year	
Date	☐	☐	☐	☐
	2	3	4	5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

Aide's SS# ☐☐☐☐☐☐☐☐☐
32 33 34 35 36 37 38 39 40

Aide's Last Name ☐☐☐☐☐☐☐☐☐☐
41 42 43 44 45 46 47 48 49 50

First Name ______________________

Aide's Sex ☐ 1. Male 2. Female
51

Aide's Race ☐ 1. White 3. Asian 5. Am. Indian
52 2. Black 4. Hispanic 6. Other

Aide's Class Type ☐ 1. Small (1-15) 2. Regular (1-25)
53 3. Regular w/Aide

Aide's Highest Degree:

☐ 1. High School/GED 3. BA/BS 5. Ed.D./Ph.D.
54 2. Associate Degree 4. M.Ed./MA/MS

TYPE OF ACTIVITY I PERFORMED TODAY

Day of Mo. ☐☐ 55 56

Day of Wk. ☐ 57

Tues - 1
Wed - 2
Thurs - 3

Please write only one of the following activity codes in each time slot box and only one subject code (WHEN APPLICABLE) in the adjacent box.

ACTIVITY CODES:

(Activity Code Definitions are on Page 2)

1. Routine Paperwork
2. Routine Student Activity
3. Whole Group Instruction
4. Small Group Instruction
5. Individualized Instruction
6. Planning and Preparation
7. Personal Time

SUBJECT CODES:

1. Reading
2. Math
3. Other

TIME SLOT	ACTIVITY	SUBJECT	TIME SLOT	ACTIVITY	SUBJECT
7:30 - 7:45	58	59	12:00 - 12:15	94	95
7:45 - 8:00	60	61	12:15 - 12:30	96	97
8:00 - 8:15	62	63	12:30 - 12:45	98	99
8:15 - 8:30	64	65	12:45 - 1:00	100	101
8:30 - 8:45	66	67	1:00 - 1:15	102	103
8:45 - 9:00	68	69	1:15 - 1:30	104	105
9:00 - 9:15	70	71	1:30 - 1:45	106	107
9:15 - 9:30	72	73	1:45 - 2:00	108	109
9:30 - 9:45	74	75	2:00 - 2:15	110	111
9:45 - 10:00	76	77	2:15 - 2:30	112	113
10:00 - 10:15	78	79	2:30 - 2:45	114	115
10:15 - 10:30	80	81	2:45 - 3:00	116	117
10:30 - 10:45	82	83	3:00 - 3:15	118	119
10:45 - 11:00	84	85	3:15 - 3:30	120	121
11:00 - 11:15	86	87	3:30 - 3:45	122	123
11:15 - 11:30	88	89	3:45 - 4:00	124	125
11:30 - 11:45	90	91	4:00 - 4:15	126	127
11:45 - 12:00	92	93	4:15 - 4:30	128	129

ACTIVITY CODES

1. Routine Paperwork would include:
   - A. Paperwork required by the school administration (i.e., forms, reports)
   - B. STAR project forms and updates
   - C. Checking or grading student paperwork

2. Routine Student Activities would include such activities as:
   - A. Taking daily attendance
   - B. Collecting and accounting for lunch money or other monies
   - C. Bus monitoring duties
   - D. Recess duty(ies)
   - E. Break in routine duties (such as bathroom, assembly, etc.)

3. Whole Group Instruction suggests any activity carried on with the class; including audience situations, i.e., discussions or instructions, presentations, common new learnings (skill presentation), "open-book" textbook sessions, choral reading.

4. Small Group Instruction suggests that a group of students is pulled from the whole group to carry on with an activity. Usually all members of the small group use the same materials. Group instruction may be set up according to academic skill levels, specific needs or interests.

5. Individual Instruction suggests working with a student "one-on-one" and/or meeting the student's instructional needs on an individual basis. For example, working with one student to strengthen a skill area would be individual instruction. Monitoring and adjusting reading, math, etc. skills on an individual basis would be contract work and individualized instruction.

6. Planning and Preparation would include:
   - A. Writing lesson plans
   - B. Preparing necessary instructional materials or aids (bulletin boards, centers, dittos, etc.)
   - C. Confering with parents, students, or educational personnel
   - D. Housekeeping duties

7. Personal Time suggests any activity where a 15-minute time block is used for a personal break or personal business (i.e., a phone call to make a doctor's appointment or going to the teacher's lounge).

Record Type ☐ Z
1
For Office Use Only

Figure C-12

PROJECT STAR
QUESTIONNAIRE FOR TEACHER AIDES

	Month		Year	
Date	☐	☐	☐	☐
	2	3	4	5

SYSTEM:
ID (6-12):
SCH NAME (13-29):
SCH TYPE (30):
UNIV RESP (31):

We need your help in answering the questions which will tell us how this year has been for you. The information you provide will be used by the research staff of the project and will be kept confidential. No answers will be related to you as an individual. Thanks for you help.

Teacher Aide's SS# ☐☐☐☐☐☐☐☐☐
32 33 34 35 36 37 38 39 40

Teacher Aide's Last Name ☐☐☐☐☐☐☐☐☐☐
41 42 43 44 45 46 47 48 49 50

First, we Need a few facts about your work as an aide. Please write the appropriate code for your answer in the box or boxes to the right of each question.

1. Including this year, how many years have you been a Project STAR aide? Do not count time as a Basic Skills First aide, only count STAR aide years.

   1=One year 3=Three years
   2=Two years 4=Four years ☐
   51

2. If you have been a STAR aide for two or more years, did you work with the same group of students each year, or were they different classes?

   1=The Same 3=Worked only
   2=Different one year ☐
   52

3. When you first began to work as a STAR aide, did you have any orientation to, or training for, your work?

1=Yes, a formal orientation
2=Yes, an informal discussion with the teacher
3=No, I just started, and we worked things out
4=Other, please describe ____________________

☐ 53

4. Do you have a formal written job description that spells out your duties? If yes, please attach a copy to this questionnaire.

1=Yes
2=No

☐ 54

5. Enter a "1" in the boxes next to all statements that describe how you and the teacher plan class activities.

A ☐ 55 The teacher plans the activities and tells me each day.

B ☐ 56 The teacher plans each week's activities and tells me at the beginning of each week.

C ☐ 57 The teacher and I plan together on a daily basis.

D ☐ 58 The teacher and I plan together weekly.

E ☐ 59 I do not participate in planning.

6. What do you like most about being an aide? Enter a "1" for the most liked, a "2" for next most liked, and a "3" for the third most liked aspect of your job.

A ☐ 59 Working with children

B ☐ 60 Teamwork with the teacher

C ☐ 61 The salary

D ☐ 62 Pleasant working situation

E ☐ 63 The work schedule

F ☐ 64 This may lead to a teaching job

7. Which of the following tasks do you perform on either a regular or occasional basis, and how much time do you spend on each? Please enter the amount of time (in minutes) you usually devote to the task per day, if it's a daily task (Column A), or time per week, if it's a weekly task (Column B). Put a "1" in Column C if it's a task you do less than once a week. FOR EXAMPLE: If you have bus duty every day and it takes 25 minutes per day, put 25 in Column A. If you do bus duty twice a week and it takes 25 minutes per day average, put 50 in Column B. If you do bus duty less than once a week, put a "1" in Column C.

	COLUMN Enter Average Time Per Day In Minutes	COLUMN B Enter Average Time Per Week In Minutes	COLUMN C I Do This Less Than Once A Week
a. Loading and unloading busses (bus duty)	66-68	69-71	72
b. Supervising children at recess	73-75	76-78	79
c. Supervising children at lunch	80-82	83-85	86
d. Grading or correcting papers for the teacher	87-89	90-92	93
e. Taking attendance, and doing reports and forms	94-96	97-99	100
f. Preparing materials for lessons or for learning centers	101-103	104-106	107
g. Working individually with special needs students	108-110	111-113	114
h. Tutoring individual children on their lessons.	115-117	118-120	121
i. Working with a reading group, math group or other instructional group (the teacher may be working with another group	122-124	125-127	128
j. Managing the whole class while the teacher is away	129-131	132-134	135
k. Teaching a lesson to the whole class	136-138	139-141	142
l. Giving tests, or to the grading tests	143-145	146-148	149
m. Working with children on computers	150-152	153-155	156
n. Preparing bulletin boards.	157-159	160-162	163
o. Working with children on art projects	164-166	167-169	170
p. Preparing art for room or hallway	171-173	174-176	177

8. What do you like least about being an aide? Enter a"1" for worst, a "2" for next worse, and a "3" for the third worst aspect of your job.

A ☐ 178 The work is not challenging

B ☐ 179 The salary

C ☐ 180 The children are hard to work with

D ☐ 181 Too much stress on the the job

E ☐ 182 Doing a teacher's job without getting recognized for it

F ☐ 183 Not having any say in the way the class is run.

9. Please give us any other comments you would like to make about the way your work has gone this year.

____

____

____

THANK YOU FOR YOUR HELP! Please give this form to the person doing the exit interviews with the teacher.

Appendix D.

Teacher Effectiveness Findings

3. Second and Third Grade Effective Teachers

A decision was made to study 65 effective teachers whose class scaled score average gains were in the top 10% and 65 less effective teachers whose class scaled score average gains were in the bottom 50% of the 680 teachers in the 2nd and 3rd grades. The same instruments and procedures to determine gain scores were used. This allowed a comparison of effective and less effective teachers. The gain scores were calculated by the Project STAR data analyst. In order to ensure observer objectivity, the teacher scores were not revealed to the observers.

a. Characteristics

The characteristics studied were: preparation, certification, experience, in-service, and Career Ladder. The 2nd and 3rd grade sample included 65 effective teachers and 60 less effective teachers. There were only 3 men. Seventy-two percent (N=47) of the effective teachers were white. The 28 percent of the effective teachers that were Black is higher than the percent of Black teachers in the Tennessee teaching force. The less effective teachers were 80% (N=48) white and 20 percent (N=12) were Black.

Only 8% (N=5) of the effective teachers were younger than 30 while 18% (N=11) of the less effective teachers were under 30 years of age. Nine percent (N=6) of the effective teachers and 7 percent (N=4) of the less effective teachers were 60 years of age or older. The majority in both effective and less effective fell between age 30 and 59. (Table D-16)

Preparation was exactly the same for both groups. Fifty-eight percent had only a BA or a BS, and 42% had also a MA or MS. Every teacher involved in the study had full primary certification.

The spread of the years of teaching experience was wider for the effective teachers than for the less effective teachers who had 43 percent (N=26) in each of 2 categories: (1) 9 years and under and (2) 10 to 19 years. There were 25% (N=16) of the effective teachers in the 9 years and under category; 19 percent (N=12) were in the 20-29 group. The largest group was 49% (N=32) in the 10 to 19 year category.

Eighty-five percent of the effective teachers were on the Career Ladder with 72% (N=47) at Level I, 4% (N=3) at Level II, and 8% (N=5) at Level III. Seventy-five percent of the less effective teachers were also on the Career Ladder with 67% (N=40) at Level I, 5% (N=3) at level II and 3% (N=2) at level III. Five effective teachers and 4 less effective teachers chose not to be on the Career Ladder. It appears that the Career Ladder is not an accurate indicator of effectiveness since 75% (N=45) of the less effective teachers were on the Career Ladder.

b. Results of Observations

Results of the comparison of effective and less effective teachers' teaching practices produced a statistically significant difference in favor of the effective teachers on the following practices:

(1) instruction is guided by a preplanned curriculum
(2) Students are carefully oriented to lessons
(3) Instruction is clear and focused
(4) Learning progress is monitored closely
(5) When students don't understand, they are retaught
(6) Instructional groups formed in the classroom fit instructional needs
(7) Incentives and rewards for students are used to promote excellence

The only one that showed no difference was high teacher expectations for student learning. (TABLE D-17)

Table D-16

Professional and Personal Characteristics of Second and Third Grade Effective and Less Effective Teachers

Characteristics		Effective (N=50)	Less Effective (N=60)
Race:	White	47 (72%)	48 (80%)
	Black	18 (28%)	12 (20%)
Age:	29 and under	5 (8%)	11 (18%)
	30-39	20 (31%)	20 (33%)
	40-49	19 (29%)	19 (32%)
	50-59	15 (23%)	6 (10%)
	60 and above	6 (9%)	4 (7%)
Preparation:			
	B.A. or B.S.	38 (58%)	35 (58%)
	M.A. or M.S.	27 (42%)	25 (42%)
Certification:			
	Full Primary	65 (100%)	60 (100%)
Total Years of Teaching Experience:			
	9 and under	16 (25%)	26 (43%)
	10 to 19	32 (49%)	26 (43%)
	20 to 29	12 (19%)	3 (5%)
	30 and above	5 (8%)	5 (8%)
Career Ladder Level:			
	Not on Career Ladder	5 (8%)	4 (7%)
	Apprentice	3 (5%)	6 (10%)
	Probationary	2 (3%)	5 (8%)
	Level I	47 (72%)	40 (67%)
	Level II	3 (4%)	3 (5%)
	Level III	5 (8%)	2 (3%)

Table D-17

Summary of Percentage Ratings on 12 Teaching Practices Second and Third Grade Effective and Less Effective Teachers

Criterion	Effective Teachers Ratings (1,2,3)	Effective Teachers Ratings (4)	Less Effective Teachers Ratings (1,2,3)	Less Effective Teachers Ratings (4)
Instruction is guided by a preplanned curriculum	17%	83%*	38%	62%
There are high expectations for student learning	33%	67%	41%	59%
Students are carefully oriented to lessons	23%	77%**	53%	48%
Instruction is clear and focused	19%	81%***	59%	41%
Learning Progress is monitored closely	19%	81%***	51%	49%
When students don't understand, they are retaught	22%	78%*	45%	55%
Class time is used for learning	13%	87%***	48%	52%
There are smooth, efficient classroom routines	11%	89%***	45%	55%
Instructional groups formed in the classroom fit instructional needs	19%	81%*	38%	62%
Standards for classroom behavior are explicit	14%	86%***	44%	56%
Personal interactions between teacher and students are positive	13%	88%***	44%	56%
Incentives and rewards for students are used to promote excellence	18%	82%*	37%	63%

* p<.05
** p<.01
*** p<.001

Organization and classroom management styles were determined from categories (1) Class time is used for learning; (2) There are smooth, efficient classroom routines; and (3) Standards for classroom behavior are explicit. All three of these categories were highly significant (**p** .001). Effective teachers reported that good organizational skills were a primary factor for effectiveness.

Although there was no statistically significant difference between instructional time of effective and less effective teachers, the effective teachers spent an additional 27 minutes per week in reading instruction, and an additional 24 minutes per week in math instruction.

Other teaching practices observed were the use of learning centers, manipulatives in math, student participation in establishing classroom rules, parent volunteers, field trips, and peer tutoring.

Another factor considered was the impact of a positive personal interaction between teachers and students on effective teaching and learning. The excellent personal student interaction of effective teachers produced significant results (p<=.001) which were verified by the effective teachers' perception that a love of children and teaching was a necessity. These teachers established a positive caring relationship through verbal praise, pats and hugs, listening, eye contact, and positive notes.

No differences were found in the teachers' perception of the role of the principal as instructional leader. Approximately 80 percent of all teachers gave positive answers to these six questions (Section 17).

c. Teachers' Perceptions of Individual Effectiveness Factors

Teachers were asked to identify 2 factors that contributed to their success as teachers. The 2 most frequently mentioned were "a love of students" and "being organized." Others reported were a sense of humor, fair play, high expectations within limits, artistic ability, communication with parents, travel experience, flexible, acceptance of students regardless of background, patience, firm but fair, and understanding.

d. Profile

Characteristic	Effective	Less Effective
1. Median Age	42 years	38.5 years
2. Median Years of Experience	14 years	12 years
3. Median Years of Experience at This Grade Level	6 years	4 years
4. Certification	Primary	Primary
5. Education	BA or BS	BA or BS
6. Career Ladder	Level I	Level I
7. Reading Workshop	65%	55%
8. Math Workshop	60%	52%
9. Classroom Management Workshop	63%	55%

Profiles of the effective and less effective teachers revealed the following similarities: (1) all were certified, (2) education level, and (3) placement on Career Ladder. The differences noted were: (1) more of the effective teachers attended workshops and (2) the effective teachers had taught longer and they had taught longer at that grade level.

e. Summary

Sixty-five percent of the second and third grade effective teachers had a small class or a full-time aide. This allowed teachers to use those teaching practices and organizational styles which are conducive to effective learning. Furthermore, small classes provided teachers with the time necessary to bring about positive personal teacher-student interactions.

However, class size seems not to have made a difference with the 43% (N=26) less effective teachers who also had a small class. This finding leads to the conclusion that small classes will be more cost effective when teachers receive training in teaching practices and organizational techniques best suited for small classes.

Teachers must be willing to receive training and be committed to try new skills and procedures. Effective teachers of small classes could assist in staff development by (1) conducting workshops to share techniques and teaching practices and (2) allowing teachers to observe in their classrooms. This training should include techniques for involving families in the education of their children, i.e., establishing effective communication with the home, home visits, and phone calls.

Figure D-1

PROJECT STAR
EFFECTIVE TEACHER PRACTICES SURVEY

SYSTEM:
SCHOOL ID:
SCHOOL NAME:
SCHOOL TYPE:
UNIV RESP:

Teacher's SS	☐ 26	☐ 27	☐ 28	☐ 29	☐ 30	☐ 31	☐ 32	☐ 33	☐ 34	
Teacher's Name	☐ 35	☐ 36	☐ 37	☐ 38	☐ 39	☐ 40	☐ 41	☐ 42	☐ 43	☐ 44

Grade Taught During Project STAR	☐ 45	0. Kindergarten 1. First Grade	2. Second Grade 4. Third Grade
Class Type During Project STAR	☐ 46	1. Small Class 2. Regular Class	3. Reg + Aide Class

---

Instructions to the Interviewer:

Each question has a title with a performance catagory and a specific practices checklist. The performance catagory is from one to four; 1 equals poor and 4 equals excellent. The practices checklist is (Y)es or (N)o if the characteristic is observed or reported.

INT. 1. ☐ 47 INSTRUCTION IS GUIDED BY A PREPLANNED CURRICULUM. 1 2 3 4 (Circle One)

☐ 48 Learning goals and objectives are developed by the Teacher.

☐ 49 The BASIC SKILLS FIRST or local equivalent is used.

☐ 50 Alternative resources and activities are identified.

☐ 51 Resources and teaching activities (e.g. Additional Reading Series) are modified to help students learn.

How do you use additional Reading Series ? ______________________________

____

____

INT.
2. ☐ 52 **THERE ARE HIGH EXPECTATIONS FOR STUDENT LEARNING.** 1 2 3 4
(Circle One)

☐ 53 What kind of class do you have this year ?
1. Below Average
2. Average
3. Above Average

☐ 54 What are the students' chances of being successful?
1. Poor
2. Good
3. Excellent

☐ 55 Quality standards for academic work are set and maintained consistently.

☐ 56 Will any students fall below the level of learning needed to be successful at the next level of education?

How do you prevent it ? ____________________

____

____

OBS.
3. ☐ 57 **STUDENTS ARE CAREFULLY ORIENTED TO LESSONS.** 1 2 3 4
(Circle One)

☐ 58 Teacher helps students get ready to learn. She explains lesson objectives in simple, everyday language and refers to them throughout lesson to maintain focus.

☐ 59 Objectives may be posted or handed out to help students keep a sense of direction. Teacher checks to see that objectives are understood.

☐ 60 The relationship of a current lesson to previous study is described. Students are reminded of key concepts or skills previously covered.

☐ 61 Students are challenged to learn, particularly at the start of difficult lessons. Students know in advance what's expected and are ready to learn.

OBS.
4. ☐ 62 **INSTRUCTION IS CLEAR AND FOCUSED.** 1 2 3 4
(Circle One)

☐ 63 Do you use the Tennessee Instructional Model (TIMS) ?

☐ 64 Lesson activities are previewed; clear written and verbal directions are given; key points and instructions are repeated; student understanding is checked.

☐ 65 Presentations, such as lectures or demonstrations, are designed to communicate clearly to students; digressions are avoided.

☐ 66 Students have plenty of opportunity for guided and independent practice with new concepts and skills.

☐ 67 To check understanding, teacher asks clear questions and makes sure all students have a chance to respond.

☐ 68 Teacher selects problems and other academic tasks that are well matched to lesson content so student success rate is high. Seatwork assignments provide variety and challenge.

☐ 69 Homework is assigned that students can complete successfully. It is typically in small increments and provides additional practice with content covered in class; work is checked and students are given quick feedback.

☐ 70 Parents help keep students involved in learning. Teacher lets parents know that homework is important and gives them tips on how to help students keep working.

OBS. 5. ☐ 71 LEARNING PROGRESS IS MONITORED CLOSELY. 1 2 3 4 (Circle One)

☐ 72 Teacher frequently monitors student learning, both formally and informally.

How ? ____

____

☐ 73 Teacher requires that students be accountable for their academic work.

How ? ____

____

☐ 74 Grading scales and mastery standards are set high to promote excellence.

☐ 75 Teacher encourages parents to keep track of student progress, too.

How ? ____

____

____

How do you keep up with students' progress ? ____________________

____

____

How do you know which ones are not performing at their maximum ability ?

____

____

INT.
OBS.
6. ☐ 76 WHEN STUDENTS DON'T UNDERSTAND, THEY ARE RETAUGHT. 1 2 3 4 (Circle One)

☐ 77 New material is introduced as quickly as possible at the beginning of the year or course, with a minimum review or reteaching of previous content. Key prerequisite concepts and skills are reviewed thoroughly but quickly.

How ? ____

____

☐ 78 Teacher reteaches priority lesson content until students show they've learned it.

☐ 79 Regular, focused reviews of key concepts and skills are used throughout the year to check on and strengthen student retention.

How do you find the time to reteach a skill that has not been mastered ?

____

____

OBS.
7. ☐ 80 CLASS TIME IS USED FOR LEARNING. 1 2 3 4 (Circle One)

☐ 81 Teacher follows a system of priorities for using class time and allocates time for each subject or lesson. She concentrates on using class time for learning and spends very little time on non-learning activities.

☐ 82 Students are encouraged to pace themselves. If they don't finish during class, they work on lessons:

☐ 83 When ? 1. Before school 2. During recess
3. After school 4. Other

OBS.
8. ☐ 84 **THERE ARE SMOOTH, EFFICIENT CLASSROOM ROUTINES.** 1 2 3 4
(Circle One)

☐ 85 Class starts quickly and purposefully; teacher has assignments or activities ready for students when they arrive. Materials and supplies are ready, too.

☐ 86 Students are required to bring the materials they need to class each day; they use assigned storage space.

☐ 87 Administrative matters are handled with quick, efficient routines that keep classroom disruptions to a minimum.

☐ 88 There are smooth, rapid transitions between activities throughout the day or class.

OBS.
9. ☐ 89 **INSTRUCTIONAL GROUPS FORMED IN THE CLASSROOM FIT INSTRUCTIONAL NEEDS.** 1 2 3 4
(Circle One)

☐ 90 When introducing new concepts and skills, whole-group instruction (actively led by the teacher) is used.

☐ 91 Smaller groups are formed within the classroom as needed to make sure all students learn thoroughly. Students are placed according to individual achievement levels.

☐ 92 Teacher reviews and adjusts groups often, moving students when achievement levels change.

What criteria do you use to place students in groups ?

☐ 93 1. Student Ach. Test Scores ☐ 94 2. Teacher Devised Test

☐ 95 3. Teacher's Opinion ☐ 96 4. Other Teacher's Opinion

☐ 97 5. Reading Checklist ☐ 98 6. Other ____________________

____

☐ 99 Which criteria do you consider most important ?

OBS.
10. ☐ 100 STANDARDS FOR CLASSROOM BEHAVIOR ARE EXPLICIT. 1 2 3 4
(Circle One)

☐ 101 Teacher lets students know that there are high standards for behavior in the classroom.

☐ 102 Classroom behavior standards are written, taught, and reviewed from the beginning of the year or the start of new courses.

☐ 103 Rules, discipline procedures and consequences are planned in advance. Standards are consistent with or identical to the building code of conduct.

☐ 104 Consistent, equitable discipline is applied for all students. Procedures are carried out quickly and clearly linked to student's inappropriate behavior.

☐ 105 Teacher stops disruptions quickly, taking care to avoid disrupting the whole class. In disciplinary action, the teacher focuses on the inappropriate behavior, not on the student's personality.

☐ 106 Teacher uses the Lee Cantor Assertive Discipline Technique.

What other behavior techniques do you use ? ______________________

____

____

OBS.
11. ☐ 107 PERSONAL INTERACTIONS BETWEEN TEACHER AND STUDENTS ARE POSITIVE. 1 2 3 4
(Circle One)

☐ 108 Teacher pays attention to student interests, problems and accomplishments in social interactions both in and out of the classroom.

☐ 109 Teacher makes sure she lets students know she really cares.

How ? ____

____

☐ 110 Students are allowed and encouraged to develop a sense of responsibility and self-reliance.

☐ 111 Students are assigned responsibility for class duties.

INT.
OBS.
12. ☐ 112 **INCENTIVES AND REWARDS FOR STUDENTS ARE USED TO PROMOTE EXCELLENCE.** 1 2 3 4 (Circle One)

☐ 113 Excellence is defined by objective standards, not by peer comparison. Systems are set up in the classroom for frequent and consistent rewards to students for academic achievement and excellent behavior. Rewards are appropriate to the developmental level of students.

☐ 114 All students know about the rewards and what they need to do to get them. Rewards are chosen because they appeal to the students.

☐ 115 Rewards are given for specific student achievements. Some rewards may be presented publicly; some should be immediately presented, others delayed in order to teach persistence.

☐ 116 Parents are told about student successes and requested to help students keep working toward excellence.

What types of incentives and rewards are used most often?

☐ 117
☐ 118
☐ 119

1. Display Student's Work
2. Prizes
3. Special Privilege or Job
4. Stickers
5. Verbal Praise
6. Others ________________________

☐ 120 ________________________

INT.
13. How do you involve the family in the child's learning ?

☐ 121 1. Distribute class newsletter.

☐ 122 2. Hold special parent conferences when needed.

☐ 123 3. Provide instructions for helping with homework.

☐ 124 4. Send home individualized notes.

☐ 125 5. Send home student's folder.

☐ 126 6. Telephone parents as needed.

☐ 127 7. Other ________________________

☐ Which do you consider most productive ?
128

INT. 14. ☐ Do you make home visits ?
129

If so, when and why ? ____________________

____

____

INT. 15. ☐ Do you use learning centers ?
130

What kind of learning centers do you use regularly ?

☐ 1. Creative Skills ____________________
131

☐ 2. Enrichments Centers ____________________
132

☐ 3. Language Arts Skills ____________________
133

☐ 4. Listening Skills ____________________
134

☐ 5. Math Skills ____________________
135

☐ 6. Reading Skills ____________________
136

☐ 7. Science Skills ____________________
137

☐ 8. Thinking Skills ____________________
138

☐ 9. Others ____________________
139

☐☐ How many centers do you have available at one time ?
140 141

☐ How long do centers usually stay up ?
142

1. One week 2. Two weeks
3. Three weeks 4. Four weeks
5. 5-6 weeks 6. Other ____________________

INT.
16. ☐ Do you use manipulatives in teaching math ?
143

☐ 1. Clocks
144

☐ 2. Concrete objects (i.e. sticks or blocks)
145

☐ 3. Money
146

☐ 4. Others ______________________________
147

____

INT.
17. What are the two characteristics that make you a good teacher ?

☐ ☐
148 149

1. I care about children.
2. I am flexible.
3. I have high expectations for my students.
4. I am very organized.
5. I am patient and understanding.
6. Other ______________________________

INT.
18. What two teaching techniques do you consider to be the most effective ?

____

____

INT.
19. When did you decide to become a teacher ?

☐
150

1. In Elem. School
2. In High School
3. In College
4. After College

Why ? ____

____

INT.
20. Spouse's Occupation: ______________________________________

☐ 1. Business 2. Education 3. Other ____________________
151

Number of Children: (Enter the number for each catagory)

☐ (boys)
152

☐ (girls)
153

Their Ages: (Enter the number for each catagory)

☐ 154 1. 0 to 4 years old. ☐ 155 2. 5 to 13 years old.

☐ 156 3. 14 to 18 years old. ☐ 157 4. 19 to 25 years old

☐ 158 5. 26 to 45 years old.

Father's Occupation: ____________________

☐ 159 1. Business 2. Education 3. Other ____________

Mother's Occupation: ____________________

☐ 160 1. Business 2. Education 3. Other ____________

Brother's and Sister's Occupations: ____________________

____

INT. 21. ☐ 161 Do you belong to a professional association ?

☐ 162 Do you work actively in the association ?

INT. 22 ☐☐ 163 164 Teacher's Age

INT. 23 ☐ 165 Birth Order
1. Oldest
2. Youngest
3. Only
4. Other

Figure D-2

PROJECT STAR
EFFECTIVE TEACHER PRACTICES SURVEY

SYSTEM:
SCHOOL ID:
SCHOOL NAME:
SCHOOL TYPE:
UNIV RESP:

Teacher's SS	☐	☐	☐	☐	☐	☐	☐	☐	☐	
	26	27	28	29	30	31	32	33	34	
Teacher's Name	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	35	36	37	38	39	40	41	42	43	44

Grade Taught During Project STAR	☐ 45	0. Kindergarten 1. First Grade	2. Second Grade 4. Third Grade
Class Type During Project STAR	☐ 46	1. Small Class 2. Regular Class	3. Reg + Aide Class

---

Instructions to the Interviewer:

Each question has a title with a performance catagory and a specific practices checklist. The performance catagory is from one to four; 1 equals poor and 4 equals excellent. The practices checklist is (Y)es or (N)o if the characteristic is observed or reported.

INT. 1. ☐ 47 **INSTRUCTION IS GUIDED BY A PREPLANNED CURRICULUM.** 1 2 3 4 (Circle One)

☐ 48 **Learning goals and objectives are developed by the Teacher.**

☐ 49 **The BASIC SKILLS FIRST or local equivalent is used.**

☐ 50 **Alternative resources and activities are identified.**

☐ 51 **Resources and teaching activities (e.g. Additional Reading Series) are modified to help students learn.**

How do you use additional Reading Series ? ______________________________

____

____

INT.
2. ☐ 52 **THERE ARE HIGH EXPECTATIONS FOR STUDENT LEARNING.** 1 2 3 4
(Circle One)

☐ 53 What kind of class do you have this year ?
1. Below Average
2. Average
3. Above Average

☐ 54 What are the students' chances of being successful?
1. Poor
2. Good
3. Excellent

☐ 55 Quality standards for academic work are set and maintained consistently.

☐ 56 What are you doing to help a child that is in danger of failing?

OBS.
3. ☐ 57 **STUDENTS ARE CAREFULLY ORIENTED TO LESSONS.** 1 2 3 4
(Circle One)

☐ 58 Teacher helps students get ready to learn. She explains lesson objectives in simple, everyday language and refers to them throughout lesson to maintain focus.

☐ 59 Objectives may be posted or handed out to help students keep a sense of direction. Teacher checks to see that objectives are understood.

☐ 60 The relationship of a current lesson to previous study is described. Students are reminded of key concepts or skills previously covered.

☐ 61 Students are challenged to learn, particularly at the start of difficult lessons. Students know in advance what's expected and are ready to learn.

OBS.
4. ☐ 62 **INSTRUCTION IS CLEAR AND FOCUSED.** 1 2 3 4
(Circle One)

☐ 63 Do you use the Tennessee Instructional Model (TIMS) ?

☐ 64 Lesson activities are previewed; clear written and verbal directions are given; key points and instructions are repeated; student understanding is checked.

☐ 65 Presentations, such as lectures or demonstrations, are designed to communicate clearly to students; digressions are avoided.

☐ 66 Students have plenty of opportunity for guided and independent practice with new concepts and skills.

☐ 67 To check understanding, teacher asks clear questions and makes sure all students have a chance to respond.

☐ 68 Teacher selects problems and other academic tasks that are well matched to lesson content so student success rate is high. Seatwork assignments provide variety and challenge.

☐ 69 Homework is assigned that students can complete successfully. It is typically in small increments and provides additional practice with content covered in class; work is checked and students are given quick feedback.

☐ 70 Parents help keep students involved in learning. Teacher lets parents know that homework is important and gives them tips on how to help students keep working.

OBS. 5. ☐ 71 LEARNING PROGRESS IS MONITORED CLOSELY. 1 2 3 4 (Circle One)

☐ 72 Teacher frequently monitors student learning, both formally and informally.

How ? ____

____

☐ 73 Teacher requires that students be accountable for their academic work.

How ? ____

____

☐ 74 Grading scales and mastery standards are set high to promote excellence.

☐ 75 Teacher encourages parents to keep track of student progress, too.

How ? ____

____

____

How do you keep up with students' progress ? ____________________

____

____

How do you know which ones are not performing at their maximum ability ?

____

____

INT.
OBS. ☐ WHEN STUDENTS DON'T UNDERSTAND, THEY ARE RETAUGHT. 1 2 3 4
6. 76 (Circle One)

☐ New material is introduced as quickly as possible at the beginning of the year or course, with a minimum review or
77 reteaching of previous content. Key prerequisite concepts and skills are reviewed thoroughly but quickly.

How ? ____

____

☐ Teacher reteaches priority lesson content until students show they've learned it.
78

☐ Regular, focused reviews of key concepts and skills are used throughout the year to check on and strengthen student retention.
79

How do you find the time to reteach a skill that has not been mastered ?

____

____

OBS.
7. ☐ CLASS TIME IS USED FOR LEARNING. 1 2 3 4
80 (Circle One)

☐ Teacher follows a system of priorities for using class time and allocates time for each subject or lesson. She concentrates on
81 using class time for learning and spends very little time on non-learning activities.

☐ Students are encouraged to pace themselves. If they don't finish during class, they work on lessons:
82

☐ When ? 1. Before school 2. During recess
83 3. After school 4. Other

OBS.
8. ☐ 84 THERE ARE SMOOTH, EFFICIENT CLASSROOM ROUTINES. 1 2 3 4 (Circle One)

☐ 85 Class starts quickly and purposefully; teacher has assignments or activities ready for students when they arrive. Materials and supplies are ready, too.

☐ 86 Students are required to bring the materials they need to class each day; they use assigned storage space.

☐ 87 Administrative matters are handled with quick, efficient routines that keep classroom disruptions to a minimum.

☐ 88 There are smooth, rapid transitions between activities throughout the day or class.

OBS.
9. ☐ 89 INSTRUCTIONAL GROUPS FORMED IN THE CLASSROOM FIT INSTRUCTIONAL NEEDS. 1 2 3 4 (Circle One)

☐ 90 When introducing new concepts and skills, whole-group instruction (actively led by the teacher) is used.

☐ 91 Smaller groups are formed within the classroom as needed to make sure all students learn thoroughly. Students are placed according to individual achievement levels.

☐ 92 Teacher reviews and adjusts groups often, moving students when achievement levels change.

What criteria do you use to place students in groups ?

☐ 93 1. Student Ach. Test Scores ☐ 94 2. Teacher Devised Test

☐ 95 3. Teacher's Opinion ☐ 96 4. Other Teacher's Opinion

☐ 97 5. Reading Checklist ☐ 98 6. Other ____________________

____

☐ 99 Which criteria do you consider most important ?

OBS.
10. ☐ STANDARDS FOR CLASSROOM BEHAVIOR ARE EXPLICIT. 1 2 3 4
100 (Circle One)

☐ Teacher lets students know that there are high standards for behavior in the classroom.
101

☐ Classroom behavior standards are written, taught, and reviewed from the beginning of the year or the start of new courses.
102

☐ Rules, discipline procedures and consequences are planned in advance. Standards are consistent with or identical to the building code of conduct.
103

☐ Consistent, equitable discipline is applied for all students. Procedures are carried out quickly and clearly linked to student's inappropriate behavior.
104

☐ Teacher stops disruptions quickly, taking care to avoid disrupting the whole class. In disciplinary action, the teacher focuses on the inappropriate behavior, not on the student's personality.
105

☐ Teacher uses the Lee Cantor Assertive Discipline Technique.
106

What other behavior techniques do you use ? ____________________

____

____

OBS.
11. ☐ PERSONAL INTERACTIONS BETWEEN TEACHER AND STUDENTS 1 2 3 4
107 ARE POSITIVE. (Circle One)

☐ Teacher pays attention to student interests, problems and accomplishments in social interactions both in and out of the classroom.
108

☐ Teacher makes sure she lets students know she really cares.
109

How ? ____

____

☐ Students are allowed and encouraged to develop a sense of responsibility and self-reliance.
110

☐ Students are assigned responsibility for class duties.
111

INT.
OBS. ☐ **INCENTIVES AND REWARDS FOR STUDENTS ARE USED TO PROMOTE EXCELLENCE.** 1 2 3 4 (Circle One)
12. 112

☐ 113 Excellence is defined by objective standards, not by peer comparison. Systems are set up in the classroom for frequent and consistent rewards to students for academic achievement and excellent behavior. Rewards are appropriate to the developmental level of students.

☐ 114 All students know about the rewards and what they need to do to get them. Rewards are chosen because they appeal to the students.

☐ 115 Rewards are given for specific student achievements. Some rewards may be presented publicly; some should be immediately presented, others delayed in order to teach persistence.

☐ 116 Parents are told about student successes and requested to help students keep working toward excellence.

What types of incentives and rewards are used most often?

☐ 117
☐ 118
☐ 119
☐ 120

1. Display Student's Work
2. Prizes
3. Special Privilege or Job
4. Stickers
5. Verbal Praise
6. Others ______________________

____

INT.
13. How do you involve the family in the child's learning ?

☐ 121 1. Distribute class newsletter.

☐ 122 2. Hold special parent conferences when needed.

☐ 123 3. Provide instructions for helping with homework.

☐ 124 4. Send home individualized notes.

☐ 125 5. Send home student's folder.

☐ 126 6. Telephone parents as needed.

☐ 127 7. Other ______________________

☐ 128 Which do you consider most productive ?

INT. 14. ☐ 129 Do you make home visits ?

If so, when and why ? ______________________________

____

____

INT. 15. ☐ 130 Do you use learning centers ?

What kind of learning centers do you use regularly ?

☐ 131 1. Creative Skills ______________________________

☐ 132 2. Enrichments Centers ______________________________

☐ 133 3. Language Arts Skills ______________________________

☐ 134 4. Listening Skills ______________________________

☐ 135 5. Math Skills ______________________________

☐ 136 6. Reading Skills ______________________________

☐ 137 7. Science Skills ______________________________

☐ 138 8. Thinking Skills ______________________________

☐ 139 9. Others ______________________________

☐☐ 140 141 How many centers do you have available at one time ?

☐ 142 How long do centers usually stay up ?

1. One week 2. Two weeks
3. Three weeks 4. Four weeks
5. 5-6 weeks 6. Other ______________________________

INT.
16. ☐ 143 Do you use manipulatives in teaching math ?

☐ 144 1. Clocks ☐ 145 2. Concrete objects (i.e. sticks or blocks)

☐ 146 3. Money ☐ 147 4. Others ______________________________

____

INT.
17. Perceptions of Principal's Role

	Strongly Agree	Agree	Disagree	Strongly Disagree	
1.	A	B	C	D	My principal is an active participant in staff development.
2.	A	B	C	D	Teachers in my school turn to the principal with instructional concerns or problems.
3.	A	B	C	D	My principal provides a clear vision of what our school is all about.
4.	A	B	C	D	My principal is a strong instructional leader.
5.	A	B	C	D	My principal communicates clearly to me regarding instructional matters.
6.	A	B	C	D	My principal's evaluation of my performance helps me improve my teaching.

INT.
18. What are the two characteristics that make you a good teacher ? ________

____

____

____

INT.
19. What advice would you give a first year teacher in order to help her/him become an excellent teacher?

____

____

____

____

____

INT.
20. When did you decide to become a teacher ?

☐ 1. In Elem. School 2. In High School
150 3. In College 4. After College

Why ? ____________________

____

INT.
21. Spouse's Occupation: ____________________

☐ 1. Business 2. Education 3. Other ____________
151

Number of Children: (Enter the number for each catagory)

☐ (boys) ☐ (girls)
152 153

Their Ages: (Enter the number for each catagory)

☐ 1. 0 to 4 years old. ☐ 2. 5 to 13 years old.
154 155

☐ 3. 14 to 18 years old. ☐ 4. 19 to 25 years old
156 157

☐ 5. 26 to 45 years old.
158

Father's Occupation: ____________________

☐ 1. Business 2. Education 3. Other ____________
159

Mother's Occupation: ____________________

☐ 1. Business 2. Education 3. Other ____________
160

Brother's and Sister's Occupations: ____________________

____

INT.
22. ☐ Do you belong to a professional association ?
161

☐ Do you work actively in the association ?
162

INT.
23. ☐☐ Teacher's Age
163 164

INT.
24. ☐ Birth Order
165

1. Oldest
2. Youngest
3. Only
4. Other

INT.
25. ☐ Grade taught in 1989-90.
166

INT.
26. ☐☐ Number of students in 1989-90.
167 168

INT.
27. ☐☐ Number of students in Project STAR class.
169 170

Appendix E.

Kindergarten through Grade Three Longitudinal Tables

TABLE E-1

Number of Schools, Students and Classes by Type Longitudinal Data Base: STAR, 1985-1989*

	Sch.	Pupils	Classes							
			Small		Regular		Regular With Aide		Total	
	N	N	N	%	N	%	N	%	N	%
Data Base K - 3 Longitudinal Analysis	54	1842	91	44	51	25	65	31	207	100

---

*In Project STAR for 4 years, in the same class type.

TABLE E-2

Design for Total Class Analysis, Showing the Source of Variation, Error Terms and Degrees of Freedom, Longitudinal Study: STAR 1985-1989, Grades K-3

Source of Variation	Error Term
Grade (G)	Schools by Location (S:L)
LOCATION x GRADE (LG)	S:L
TYPE (T)	S:L
TYPE x GRADE (TG)	TxS:L
LOCATION x TYPE x GRADE (LTG)	TxS:L

	Degrees of Freedom			
	WSS	Reading	Math	Listen
Schools:Location (S:L)	52	54	54	54
Type x Schools (TxS:L)	81	89	89	89

TABLE E-3

Design for Analysis by Race, Showing Source of Variation, Error Terms and Degrees of Freedom, Longitudinal Study: STAR 1985-1989, Grades K-3

Source of Variation	Error Term
GRADE (G)	SCHOOLSxRACExLOCATION (S:R:L)
LOCATION x GRADE (LG)	S:R:L
TYPE x GRADE (TG)	TxS:R:L
RACE (R)	S:R:L
RACE x GRADE (RG)	S:R:L
LOCATION x RACE x GRADE (LRG)	S:R:L
LOCATION x TYPE x GRADE (LTG)	TxS:R:L
RACE x TYPE (RT)	TxS:R:L
RACE x TYPE x GRADE (RTG)	TxS:R:L
LOCATION x RACE x TYPE x GRADE (LRTG)	TxS:R:L

	Degrees of Freedom			
	WSS	Reading	Math	Listen
Schools:Race:Location (S:R:L)	51	52	53	54
Type x Schools:Race: Location (TxS:R:L)	76	84	84	84

TABLE E-4

Analysis of Variance Results, Expressed as Significance Levels, Project STAR, Longitudinal Analysis (1985-1989) Showing the Total Class Result and the Class Results by Race, Grades K-3

	Word Study Skills	Total Read	Total Math	Total Listen
GRADE	p<.001	p<.001	p<.001	p<.001
LOC. X GRADE	N.S.	p<.001	N.S.	N.S.
TYPE X GRADE	N.S	N.S.	N.S.	N.S.
LOC X TYPE X GRADE	N.S.	N.S.	p<.05	N.S.
RACE X GRADE	N.S.	N.S.	N.S.	N.S.
RACE X LOC. X GRADE	N.S.	N.S.	N.S.	N.S.
RACE X TYPE X GRADE	N.S.	N.S.	N.S.	N.S.
RACE X LOC. X TYPE X GRADE	p<.001	p<.06	p<.05	p<.05

TABLE E-5

Total Reading Mean Scores by Location: STAR, 1985-1989

	K	Gain K-G1	G1	Gain G1-G2	G2	Gain G2-G3	G3	Gain K-G3
Inner-city	435.6	68.0	503.6	68.0	571.6	39.6	611.2	175.6
Suburban	448.3	91.0	539.3	56.6	595.9	29.0	624.9	176.6
Rural	446.2	103.9	550.1	55.8	605.9	24.2	630.1	183.9
Urban	449.1	99.0	548.1	50.7	598.8	22.5	621.3	172.2
		13.5*		46.5*		34.3*		18.9*

*Largest difference between Inner City and any other group.

Appendix F.

Student Socioeconomic Status Additional Results

1. Effects of Class Size on Free Lunch and Non-Free Lunch Students

The information in this section is based upon students' designation as free lunch or non-free lunch. Although overall the two groups were about equal, only in the rural schools were they close with 60 percent non-free lunch and 40 percent free lunch.

Socioeconomic status is strongly related to students' achievement scores. In every instance in all four grades the non-free lunch students out-scored the free lunch students. (TABLE F-1)

TABLE F-1

Comparison of Stanford Achievement Total Reading Scaled Score Average for All Free Lunch and Non-Free Lunch Students by Grade Level

Total Reading	Free Lunch		Non-Free Lunch	
Kindergarten	428.0	(N=2787)	444.8	(N=2981)
Grade 1	500.8	(N=3145)	541.2	(N=3087)
Grade 2	567.0	(N=2869)	600.1	(N=2956)
Grade 3	602.6	(N=2841)	627.8	(N=2984)

Comparison of Stanford Achievement Total Math Scaled Score Average for All Free Lunch and Non-Free Lunch Students by Grade Level

Total Math	Free Lunch	Non-Free Lunch		
Kindergarten	473.3	(N=2821)	496.6	(N=3029)
Grade 1	516.7	(N=3271)	544.9	(N=3156)
Grade 2	566.5	(N=2862)	594.1	(N=2953)
Grade 3	605.2	(N=2892)	630.4	(N=3010)

In kindergarten math there was a 24 point difference in average scaled scores of free lunch and non-free lunch students (473 to 497) and in reading there was a 17 point difference (428 to 445). The greatest difference was found in first grade reading. The difference between free lunch and non-free lunch in reading was 40 scaled score points and in math the non-free lunch students were 28 scaled score points higher than the free lunch students. In second grade, the free lunch students had an average reading scaled score of 567 and the students not on free lunch had an average reading scaled score of 600 which is 33 points higher. In math the non-free lunch students scored 27 scaled score points higher than the free lunch students. The scaled score for non-free lunch students in third grade was 25 points higher than free lunch students in both math and reading.

The next question to be asked was, "Do free lunch students score higher in small classes than in regular and regular/aide classes?" Tables F-2 through F-6 provide an affirmative answer in all grades and all locations with four exceptions. Free lunch students scored higher in urban reading second grade regular/aide and third grade regular; rural math first grade regular/aide and second grade regular/aide. Based on this information the difference between free-lunch and non-free lunch students' scores in small classes should be less than the difference between free lunch and non-free lunch students in regular classes and also in regular/aide classes. The difference was less in all grade levels except first grade. In the first grade regular class the difference was .7 points less than the small class difference and in the regular/aide the difference was 1.8 less than the small class difference.

Table F-2

A Comparison of Stanford Achievement Total Reading and Math Scaled Score Average for Free Lunch and Non-Free Lunch Students by Grade Level by Class Type

READING

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	432.0 (N=819)	448.2 (N=912)	16.2	425.5 (N=950)	443.0 (N=1051)	17.5	427.2 (N=1018)	443.7 (N=1018)	16.5
1	508.5 (N=856)	549.4 (N=929)	40.9	494.4 (N=1242)	534.6 (N=1145)	40.2	502.0 (N=1047)	541.1 (N=1013)	39.1
2	574.4 (N=806)	604.0 (N=927)	29.6	562.4 (N=1006)	596.6 (N=962)	32.2	565.7 (N=1057)	599.9 (N=1067)	34.2
3	608.1 (N=872)	632.0 (N=996)	23.9	599.7 (N=872)	625.3 (N=869)	25.6	600.4 (N=1097)	626.1 (N=1119)	25.7

MATH

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	478.8 (N=828)	502.0 (N=912)	23.2	471.4 (N=963)	493.8 (N=1064)	22.4	470.8 (N=1030)	494.5 (N=1039)	23.7
1	523.5 (N=883)	552.5 (N=949)	29.0	512.0 (N=1291)	540.2 (N=1167)	28.2	516.8 (N=1097)	543.2 (N=1066)	26.4
2	572.0 (N=803)	598.5 (N=925)	26.5	563.7 (N=1005)	591.9 (N=962)	28.2	565.1 (N=1054)	592.1 (N=1066)	27.0
3	609.8 (N=884)	633.9 (N=1007)	24.1	604.6 (N=888)	628.0 (N=871)	23.4	602.1 (N=1120)	629.1 (N=1132)	27.0

Table F-3

A Comparison of Stanford Achievement Total Reading and Math Scaled Score Average for Inner-City FreeLunchand Non-FreeLunch Students by Grade Level by Class Type

READING

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	429.9 (N=316)	440.5 (N=46)	10.6	423.2 (N=389)	432.9 (N=60)	9.7	427.6 (N=435)	438.0 (N=39)	10.4
1	498.1 (N=321)	501.6(N=47)	3.5	480.0 (N=496)	517.7 (N=43)	37.7	484.6 (N=373)	523.7 (N=26)	39.1
2	565.2 (N=305)	583.2 (N=58)	18.0	549.3 (N=424)	557.4 (N=26)	8.1	553.2 (N=196)	580.7 (N=42)	27.5
3	604.8 (N=315)	618.0 (N=42)	13.2	590.0 (N=338)	611.1 (N=32)	21.1	592.8 (N=431)	614.6 (N=43)	21.8

MATH

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	475.8 (N=319)	490.0 (N=45)	14.2	466.4 (N=399)	477.5 (N=60)	11.1	465.6 (N=438)	486.3 (N=39)	20.7
1	516.5 (N=322)	519.3 (N=47)	2.8	502.2 (N=500)	524.1 (N=43)	21.9	506.8 (N=377)	529.7 (N=26)	22.9
2	564.4 (N=303)	582.4 (N=57)	18.0	555.1 (N=425)	571.4 (N=26)	16.3	554.7 (N=423)	582.4 (N=42)	27.7
3	607.4 (N=315)	621.3 (N=41)	13.9	596.7 (N=336)	612.0 (N=32)	15.3	594.8 (N=426)	614.9 (N=43)	20.1

Table F-4

A Comparison of Stanford Achievement Total Reading and Math Scaled Score Average for Suburban FreeLunch and Non-Free Lunch Students by Grade Level by Class Type

READING

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	437.8 (N=107)	449.5 (N=294)	11.7	425.8 (N=109)	445.7 (N=289)	19.9	427.0 (N=121)	443.5 (N=326)	16.5
1	517.8 (N=133)	550.3 (N=301)	32.5	499.7 (N=227)	529.3 (N=383)	29.6	494.7 (N=151)	535.8 (N=310)	41.1
2	572.2 (N=155)	600.1 (N=300)	27.9	563.1 (N=160)	592.9 (N=338)	29.8	553.5 (N=195)	595.2 (N=365)	41.7
3	603.7 (N=144)	630.5 (N=302)	26.8	598.0 (N=179)	623.9 (N=332)	25.9	599.1 (N=205)	626.4 (N=355)	27.3

MATH

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	484.7 (N=110)	500.4 (N=309)	15.7	485.0 (N=110)	498.4 (N=297)	13.4	478.8 (N=125)	497.9 (N=341)	19.1
1	525.7 (N=135)	554.0 (N=302)	28.3	512.5 (N=233)	537.5 (N=389)	25.0	507.9 (N=153)	537.0 (N=316)	29.1
2	572.2 (N=155)	597.5 (N=299)	25.0	554.6 (N=166)	585.2 (N=339)	30.6	549.6 (N=195)	584.1 (N=363)	34.5
3	601.3 (N=144)	633.6 (N=299)	332.3	599.5 (N=178)	625.7 (N=319)	26.2	596.8 (N=206)	627.0 (N=331)	27.3

TableF-5

A Comparison of Stanford Achievement Total Reading and Math Scaled Score Average for Rural Free Lunch and Non-Free Lunch Students by Grade Level by Class Type

READING

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	432.3 (N=329)	447.0 (N=472)	14.7	427.8 (N=398)	441.6 (N=603)	13.8	427.5 (N=368)	443.0 (N=549)	15.5
1	515.7 (N=810)	551.9 (N=323)	36.2	506.4 (N=434)	538.3 (N=611)	31.9	520.9 (N=404)	544.2 (N=579)	23.3
2	584.0 (N=292)	609.0 (N=490)	25.0	575.1 (N=377)	600,5 (N=558)	25.4	583.1 (N=381)	603.0 (N=593)	19.9
3	612.7 (N=344)	633.1 (N=557)	20.4	609.7 (N=317)	627.8 (N=486)	18.1	609.3 (N=373)	627.2 (N=631)	17.9

MATH

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	481.4 (N=331)	503.4 (N=472)	22.0	473.7 (N=398)	492.8 (N=606)	19.1	474.6 (N=372)	495.0 (N=553)	20.4
1	529.3 (N=345)	552.7 (N=507)	23.4	521.6 (N=490)	542.2 (N=627)	20.6	530.9 (N=447)	546.8 (N=597)	15.9
2	580.7 (N=291)	601.0 (N=490)	20.3	577.4 (N=375)	597.4 (N=557)	20.0	584.3 (N=381)	597.4 (N=594)	13.1
3	615.0 (N=356)	634.1 (N=572)	19.1	614.5 (N=338)	631.2 (N=491)	16.7	611.7 (N=400)	632.1 (N=648)	20.4

TableF-6

A Comparison of Stanford Achievement Total Reading and Math Scaled Score Average for Urban Free Lunch and Non-FreeLunch Students by Grade Level by Class Type

READING

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	431.0 (N=67)	453.9 (N=100)	22.9	425.0 (N=54)	449.3 (N=99)	24.3	423.9 (N=94)	449.9(N=104)	26.0
1	514.2 (N=79)	557.8 (N=94)	43.6	504.0 (N=85)	539.3 (N=188)	35.3	502.2 (N=117)	544.8 (N=98)	42.6
2	581.0 (N=54)	603.3 (N=79)	22.3	577.7 (N=39)	600.2 (N=40)	22.5	583.1 (N=56)	610.0 (N=67)	26.9
3	609.3 (N=67)	636.2 (N=95)	26.9	613.1 (N=35)	615.1 (N=29)	2.0	602.9 (N=88)	623.0 (N=90)	20.1

MATH

	SMALL			REGULAR			REGULAR/AIDE		
Grade	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference	Free Lunch	Non-Free Lunch	Difference
K	470.5 (N=68)	505.9 (N=100)	35.4	463.8 (N=56)	495.6 (N=101)	31.8	468.8 (N=94)	493.7 (N=106)	24.9
1	23.72 (N=80)	562.8 (N=93)	39.1	515.4 (N=88)	544.9 (N=108)	29.5	507.3 (N=120)	544.7 (N=99)	37.4
2	566.5 (N=54)	598.9 (N=79)	32.4	563.7 (N=39)	585.3 (N=40)	21.6	566.0 (N=55)	595.1 (N=67)	16.4
3	611.8 (N=67)	638.9 (N=79)	27.1	610.7 (N=35)	615.8 (N=29)	5.1	606.3 (N=88)	622.7 (N=90)	29.1

With affirmative answers to these two questions, the next assumption is that achievement differences between small classes and regular classes should be greater for free lunch students than for non-free lunch students. In order to determine the advantage (achievement difference) that free lunch students in small classes have over free lunch students in regular classes the scaled scores were compared (Table F-7). This table also includes the advantage that non-free lunch students in small classes have over non-free lunch students in regular classes. In kindergarten the advantage was 6.5 for the free lunch population in small over regular, while the advantage for non-free lunch was 5.2 for the small class over the regular class. This is a very small difference in the value of a small class for free lunch students over non-free lunch students. In first grade the advantage was .7 in favor of the non-free lunch regular class students.

Table F-7

A Comparison of the Advantage of a Small Class over a Regular Class for Free Lunch and Non-Free Lunch Students in Reading and Math

TOTAL READING

	Total Population		Inner-City		Suburban		Rural		Urban	
Grade	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free
K	6.5	5.2	6.7	7.6	12.0	3.8	4.5	5.4	6.0	4.9
1	14.1	14.8	18.1	-16.1	18.1	21.0	9.3	13.6	10.2	18.5
2	12.0	7.4	15.9	25.8	9.1	7.2	8.9	8.5	3.3	3.1
3	8.4	6.7	14.8	6.9	5.7	6.6	3.0	5.3	-3.8	21.1

TOTAL MATH

	Total Population		Inner-City		Suburban		Rural		Urban	
Grade	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free
K	7.4	8.2	9.4	12.5	-0.3	2.0	7.7	10.6	6.7	10.3
1	11.5	12.3	14.3	-4.8	13.2	16.5	7.7	10.5	8.3	17.9
2	8.3	6.6	18.0	11.0	17.9	12.3	3.3	3.6	2.8	13.6
3	5.2	5.9	-13.9	9.3	1.8	7.9	0.5	2.9	1.1	23.1

The advantage scores were obtained by subtracting the scaled score average of the Free Lunch students in a regular class from the score of the Free Lunch students in a small class. The advantage score for the non-free lunch students was obtained in the same way. Tables F-2 through F-6 have the scaled scores from which these advantages were computed.

The advantage (4.6) of the small class over regular class for the free lunch students was greater than for the non-free lunch students in second grade. It was also 1.7 greater in third grade. The regular/aide produced less advantage (Table F-8) than the small class except in first grade where the regular/aide difference was 1.1. In second grade when the small class advantage was the highest of all, the regular/aide was at 0 and in third grade at -.1.

Table F-8

A Comparison of the Advantage of a Regular/Aide Class over a Regular Class for Free Lunch and Non-Free Lunch Students in Reading and Math

TOTAL READING

	Total Population		Inner-City		Suburban		Rural		Urban	
Grade	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free
K	1.7	0.7	4.4	5.1	1.2	-2.2	-0.3	1.4	-1.1	0.6
1	7.6	6.5	4.6	6.0	-5.0	6.5	14.5	5.9	1.8	5.5
2	3.3	3.3	3.9	23.3	-9.6	2.3	8.0	2.5	5.4	9.8
3	0.7	0.8	2.8	3.5	1.1	2.5	-0.4	-0.6	-10.2	7.9

TOTAL MATH

	Total Population		Inner-City		Suburban		Rural		Urban	
Grade	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free	Free	Non-Free
K	-0.6	0.7	-0.8	8.8	-6.2	-0.5	0.9	2.2	5.0	-1.9
1	4.8	3.0	4.6	5.6	-4.6	-0.5	9.3	4.6	-8.1	-0.2
2	1.4	0.2	-1.9	2.9	-5.0	-1.1	6.9	0.0	2.3	9.8
3	-2.5	1.1	-0.4	11.0	-2.7	1.3	-2.8	0.9	-4.4	6.9

The advantage scores were obtained by subtracting the scaled score average of the Free Lunch students in a regular class from the score of the Free Lunch students in a regular/aide class. The advantage score for the non-free lunch students was obtained in the same way. Tables F-2 through F-6 have the scaled scores from which these advantages were computed.

When students were grouped by location and by class type, in only two instances did the regular non-free lunch group have an advantage over the non-free lunch group in small class. In the inner city first grade reading and math the non-free lunch regular class had an advantage score of -16.1 in reading and -4.8 in math. In only three instances did the regular class free lunch students have a greater advantage than the small class free lunch students: Reading in urban schools in third grade; math in the inner city in third grade; math in suburban kindergarten.

Appendix G.

Project STAR Abstracts

ABSTRACT

JANE WRIGHT ELDRIDGE. A Study of the Relationship Between Class Size and Teacher Absence (under the direction of DR. HELEN PATE BAIN.)

The primary purpose of this study was to investigate the relationship between teacher absence and class sizes -- small 1:15 (X), regular 1:25 (R), and regular 1:25 with a full-time aide (Ra). Each could vary by two pupils. The secondary purpose was to evaluate five causes of absence: personal/family illness, professional/personal leave, and other. The third purpose was to investigate the relationship between student achievement (Stanford Primary I) and teacher absence.

The sample was Project STAR first grade teachers (1986-87). Analysis consisted of the ANOVA and crosstabulation procedures to test significance between (1) three types of class size and teacher attendance, (2) five causes of teacher absence and three types of class size, and (3) three levels of student achievement for Mathematics and Reading and three types of class size and teacher attendance. Crosstabulations were regrouped calculating four levels of teacher attendance, three types of class size, and three levels of student achievement for Mathematics and Reading.

Findings yielded no statistically significant difference between teacher attendance and class size, and between causes of teacher absence and class size. Personal illness was the most frequently used cause. Significance was found between low Mathematics achievement and class size and teacher attendance by use of the ANOVA. Scheffe showed significance between the (S) and (Rz). Significance was also found between low teacher attendance and class size and student reading achievement. Comparison of the cells of both groupings of crosstabulations of teacher attendance, class size and student achievement showed a trend of clustering low teacher attendance with low student achievement in the (R) and (Ra) classes. The small class (X), unaffected by teacher attendance, clustered in the higher achievement cells.

Recommendations: (1) Broader study of teacher attendance and student achievement; (2) Exploration of ways to fight teacher absenteeism by discovering the sources of teacher frustration and satisfaction; (3) Development of awareness program to show the results of Project STAR and to lobby for small class size statewide.

ABSTRACT

JANET PARSONS BROWN. Teacher Attendance in Small Size Classes (under the direction of DR. PAUL MADDEN)

The primary purpose of this study was to research the attendance of kindergarten teachers in three class size types: small classes (1:15), regular classes (1:25), and regular classes with a full-time aide. As secondary considerations, the attendance rates for these kindergarten teachers were also researched and compared according to the school types to which they were assigned (inner city, rural, urban, suburban), their experience levels (0-5, 6-11, 12 or more years), and the degrees held (bachelor's or master's or above).

There was a total of 336 kindergarten teachers assigned to 79 public schools, in 42 school systems from all areas of Tennessee who were considered for this study. These teachers who were participants in the Student Teacher Achievement Ratio (STAR) project during the 1985-86 school year, had been randomly assigned to one of the three class size situations. For this research study, the number of days absent and the number of days present for this target year were collected, and computed into an attendance rate for each teacher. No distinction was made between the reasons for teacher absences.

The crosstabulation procedure was used to determine the distribution frequency of the teachers among class size, school types, degrees held, and experience levels, an ANOVA statistical procedure was used to compare the mean attendance rates for each of the categories of the dependent variables.

The results of these statistical procedures showed no significant differences in the attendance rates of teachers among the three categories of class size, the four school types, the two levels of degrees held, or the three experience levels. Teachers reported feeling much lower levels of job-related stress in small classes. They also believed they were more effective teachers in the small size classes.

This study concludes that while teacher attendance is not affected by class size, school type, degrees held, or the experience level of the teacher, teachers perceive themselves as more effective and less stressed in small classes. It is therefore recommended that further research be conducted.

ABSTRACT

DEBORAH A. HOLLADAY. The Effects of Small 1:15 Class Size on Retained First Grade Students (under the direction of DR. PAUL MADDEN and DR. HELEN PATE BAIN)

The primary purpose of this research was to study the effects of 1:15 classes on first grade retainees. Reading and mathematics achievement, the student's birth order, number of parents, and attendance rates during the 1986-87 school year were the areas investigated.

They study compared first grade retainees in three 1:15 experimental (X) classes composed of all retainees in three Project STAR (Student/Teacher Academic Ratio) schools with all other Project STAR first grade retainees who were interspersed with other students in control classes of 1:15 (OS), 1:25 (Or), and 1:25 with an aide (Or/a). Retainees in the (X) classes were compared with retainees in forty-two control classes in twenty-five schools.

Data were analyzed using a one-way analysis of variance, a Scheffe Post Hoc Analysis, an uncorrelated t test, and a crosstabulation procedure with a chi-square test of significance. A difference that was statistically significant was found between the experimental classes and some control classes on reading and mathematics achievement on the Stanford Achievement Test and Basic Skills First Test at the .05 level of significance. The small (X) classes consistently scored above the control classes of (Ox), (Or), and (Or/a).

The (X) classes were significantly higher than the (Or) classes on the SAT Reading, and higher than (Or) and (Os) on the SAT Math. The (X) classes were significantly higher than the (Or), (Ox), and (Or/a) on the Basic Skills First (BSF) Reading and Math results. No significant differences were found between the small 1:15 experimental classes and student birth order, number of parents, and rate of attendance. This research then concludes that a small 1:15 class composed of all retainees is the most beneficial classroom setting for retained first grade students. The study should be replicated using second grade retainees to provide further support and evidence.

ABSTRACT

ROSEANNE K. JACOBS. The Effects of Class Sizes of 1:15, 1:25, 1:25 Plus a Full-Time Aide on Kindergarten Reading Readiness Achievement (under the direction of DR. PAUL MADDEN and DR. HELEN BAIN.)

One hundred and forty teachers participating in the first year of Project STAR (Student Teacher Academic Ratio) in 1985-86 submitted for 2,837 kindergarten students data indicating mastery or non-mastery of the 25 reading readiness objectives of the Tennessee Basic Skills First program. Project STAR is a four-year $12 million dollar longitudinal study of class size funded by the Tennessee General Assembly.

Data were analyzed using a five-way analysis of variance and a crosstabulation procedure with a chi-square test of significance. A statistically significant relationship was found between small class size and reading readiness achievement in the total 25 tested Basic Skills and the subcategory of the 20 comprehension skills at the .01 level of significance. The 1:15 class mastered one more objection than the 1:25 class and .6 more of an objective than the 1:25 plus a full-time aide class. No significant relationship was found between classes of 1:15, 1:25, or 1:25 pluss a full-time aide and the mastery of the 5 word identification skills. The 1:25 class was found to be least effective in achieving reading readiness. Students achieve better in all three types of classes when they are present over 90 percent of the time. Students in classes of 1:15 who attended 90 percent of the time showed the greatest gain. The statistically significant relationship was found between sex, race, socioeconomic status, geographic localities, and achievement in the three reading readiness areas analyzed. Within each variable category, the lowest mean scores in the 25 total Basic Skills and the 20 comprehension skills were for males, blacks, free/reduced lunch, and inner-city students in the 1:25 class, and the highest scores for this group were in the 1:15 class. It would seem from this study that it would be most cost effective if this group were in a 1:15 class.

The recommendations include:

1. **Kindergarten should be mandatory.**
2. **Pupil/teacher ratio should be 1:15 for kindergarten students.**
3. **Teachers should be trained to:**
    - a. **Utilize small group instruction.**
    - b. **Utilize home visits and parent training to reinforce readiness skills.**

Appendix H.

Do Teacher Aides Improve Student Performance?*

At the time that Tennessee's legislatively mandated study of class size (Project STAR) was being designed in 1985, the state had just begun to provide support for teacher aides in grades K through 3. The staff of the State Department of Education and the State Board of Education were interested in whether aides were effective in helping teachers to improve instruction and thus improve the performance of students, so Project STAR was designed to allow the evaluation of the effects of teacher aides, as well as small classes.

Previous Research on Teacher Aides

There is extensive literature about the use of teacher aides and "assistant teachers" in classrooms. The major part of the literature is descriptive, indicating how aides were used and/or what they did, how they should be trained, and how teachers felt about them (Park, 1956; Howell et al., 1958; Bennett & Folk, 1968; Rasp & MacQuarrie, 1986; Johnson, 1987). The literature indicated teachers generally felt aides were helpful and that they enabled the teacher to spend more time on instruction and less on clerical and custodial activities (monitoring recess or lunchroom, for example). While a majority of teachers were positive about using aides and the ways they could be helpful, several studies indicated that a small percent of teachers were neutral or negative about them. Issues of training for aides and certification of aides were also themes in the literature.

A few studies attempted to assess the effect of aides on student achievement in the early elementary grades, using experimental or quasi experimental designs (Howell et al., 1958; Bennett, 1970; Holzmiller, 1982; Handley, 1986; Jackson et al., 1985; Johnson, 1988). Two studies found greater gains in student achievement in the classes with aides, while the other studies found either mixed results (some tests significant, others not) or no significant pupil gains in classes with aides. The previous research is positive on teacher reactions to aides and teachers beliefs that a teacher aide allows them to spend more time on instruction; it is inconclusive on whether an aide leads to higher student achievement.

Data Collection About Teacher Aide Activities

For the teacher aides, information was obtained about their years of experience, their education, age, and sex. Teacher aides also completed a task checklist which listed 15 different activities and asked about the amount of time spent in each activity (i.e., taking attendance and doing reports and forms; working individually with special needs children; managing the whole class when the teacher is away). (See Appendix C for data collection instruments.) Teachers were also asked during their exit interviews how they used their aides and if they used them primarily in a clerical capacity or primarily as instructional assistants.

The Use of Teacher Aides in Project STAR

A few school systems had provided teacher aides prior to the mid-1980s as a local decision, locally funded. The State began to provide a teacher aide for every 75 pupils in grades 1-3 in 1984 to help teachers with the increased paperwork involved in implementing the Basic Skills First program. Aides did not have to be certified or have college training or any specific educational background. They were employed primarily as clerical rather than instructional assistants, but teachers were allowed to assign them a variety of tasks, such as tutoring individual children, preparing materials for class, filling out forms, and monitoring recess. There was no state salary schedule for aides and no special training programs for them. These were local responsibilities.

Decisions about who would be hired and what they would be paid as aides for Project STAR were made locally, consistent with the existing patterns of local responsibility for employment of aides. Most of the Project STAR aides received no special training in their duties, and teachers did not have any training in how to utilize an aide effectively. Fewer than a dozen of the kindergarten aides had written job descriptions; the aides' roles were worked out informally with the teacher. This led to substantial variation in the way aides were used in Project STAR.

A brief orientation manual for teachers and aides on the roles and responsibilities of aides was developed by the state and was adapted for use with the teachers and aides in Project STAR in first, second and third grade. Teachers and aides reviewed the manual at the beginning of each school year as a part of the Project STAR orientation program. In second and third grade a sub-sample of 17 teachers each year got training in working with an aide as a part of the special training program provided in STAR.

Project STAR followed the principle that participating schools should not reduce the services available to any student. In kindergarten, regular class teachers did not have the services of the Basic Skill First aides; this allowed the comparison of aide with no aide conditions. This was justified because the state did not provide aides for kindergarten, only for the first three grades. However, in grades 1, 2, and 3, the regular classes (and the small classes) were allowed to have the part-time services of an aide. Figure 1 shows the average number of days in the month that small, regular, and regular/aide classes used an aide for at least part of a day. The regular classes used aides on the average for nearly 18 days a month. Since typical use was part-time, the aide services to the regular classes are the equivalent of 25 to 33 percent of a full-time aide. Project STAR's basic comparison is between regular classes that have aide services for 25 to 33 percent of the time and similar sized classes that have a full-time aide. This reduced the regular/aide - regular comparison, but whether the effect of the reduction is proportional to the amount of aide time spent in regular classes cannot be determined.

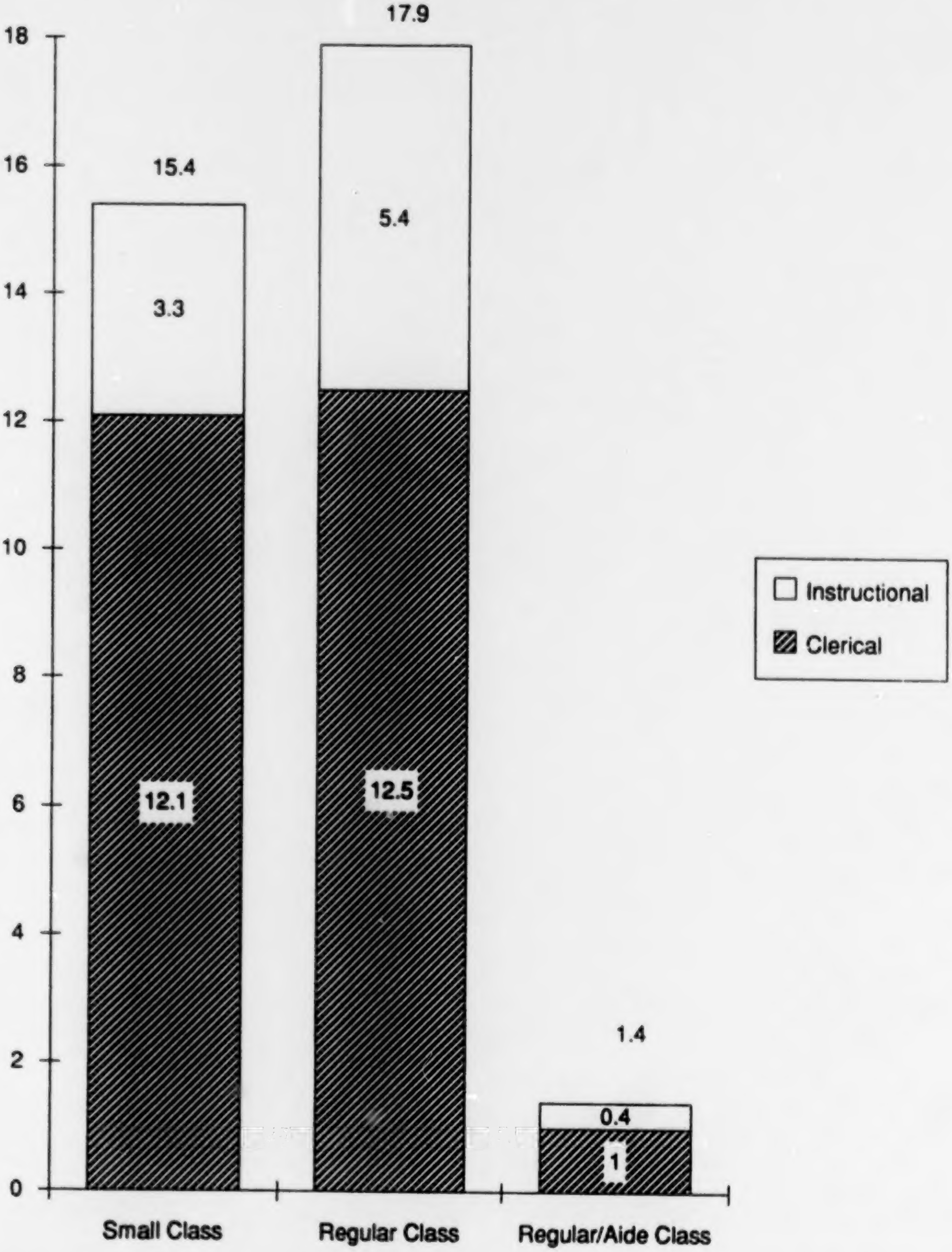
Who were the Aides and What Did They Do?

Aides had on the average about three years' experience as an aide. With the exception of one male aide in the third grade, they were all female; about 70 percent were white and 30 percent black. About 55 percent of the aides had only a high school education; another 37 percent had some college but no degree. Between 5 and 10 percent were college graduates, and between 5 and 8 percent had previously been teachers. Some of the aides at the top end of the education ladder were hoping to get the next teaching vacancy.

The salary varied by districts but averaged a little more than $7,000 a year. It is not surprising that about 60 percent of the aides listed salary as the least desirable aspect of their jobs in a questionnaire. Two-thirds said that working with children was the most attractive thing about their job. About 18 percent felt that the schedule was the most attractive part of the job, while teamwork with the teacher was a top choice for about 15 percent.

FIGURE H-1

Average Days of Usage of Basic Skills Aides Per Month by Class Type



A day of use is use for any part of the day.

Aides in the second and third grades responded to a questionnaire that asked them to identify how much time they spent on each of 16 different activities divided into three broad categories: custodial (e.g., supervising children at lunch); clerical (e.g., taking attendance, grading papers for the teacher); or instructional (e.g., tutoring individual children). The average amount of time per week spent in each area of activities was: custodial, 4.8 hours; clerical, 10.6 hours; instructional, 7.4 hours (see Table H-1). There is a large variance around these averages which is not surprising since teachers and aides worked out their schedules with very few guidelines.

TABLE H-1

Average Amount of Time Spent on Various Tasks By Project STAR 3rd Grade Aides

Type of Activity	Mean Hours Per Week	Standard Deviation	% of Aides Doing
Custodial	4.8	3.28	91%
Supervising recess	0.6		31%
Supervising lunch	3.8		84%
Other	0.4		
Clerical	10.6	5.02	100%
Preparing materials for lessons or learning centers	2.3		84%
Grading papers & tests	7.1		97%
Completing forms & reports	1.2		78%
Instructional	7.4	5.10	90%
Tutoring individual children	2.9		72%
Working with special needs students	1.8		50%
Working with a reading or math group	2.4		70%
Teaching a lesson to the whole class	0.2		16%

Approximately 1/4 of the 30-hour week was spent in other activity.

The project supplied general guidelines for aides in grades 1, 2, and 3. These provided that: 1) aides could not serve as substitute teachers; 2) aides were to work under the direct supervision of the teacher; and 3) aides were not to be used for more than one hour a day in duties outside the classroom (such as supervision of recess or lunch). The guidelines were advisory, not regulatory. For example, about 20 percent of the aides reported that they spent more than an hour a day in activities outside the classroom. The variation in aide activities provided an opportunity to see if differences in what the aide did had any effect on student learning.

Teacher Preferences

In the year-end interview, teachers were asked whether they would prefer to have a small class or an aide as their regular teaching condition. Several teachers gave conditional responses such as, "It would depend on who the aide was." There was an overall preference for small classes rather than aides, but this depended partly on the teacher's own experience. Eighty percent of the teachers who had a small class preferred a small class and 56 percent of the teachers who had an aide would have preferred a small class. The teachers who had a regular class chose a small class 71 percent of the time. Data from third grade teachers' interviews showed that having an aide did seem to increase teachers' interest and enthusiasm for them.

Effects of an Aide on Student Achievement

Students in regular/aide classes did not achieve at significantly higher levels than students in the regular classes in kindergarten or grades 2 and 3 (Table H-2). In grade 1, however, students in regular/aide classes did score significantly higher in both Total Reading and Math than did students in the regular classes. Scores in the subtests of Reading (Word Study, Reading Comprehension) and Math (Math Reasoning, Math Computation), and in Listening were similar in pattern and magnitude to the Total Reading and Total Math scores each year.

Aides were less effective than small classes in enhancing student performance at each grade level. The overall pattern of student achievement in small classes was for students in kindergarten to outperform the regular classes, and in first grade to outperform the regular classes by an even larger margin. Regular/aide classes had only slightly higher achievement scores than the regular classes in kindergarten, but had almost as large a gain in achievement in first grade as the small classes. After the first grade, the aide advantage over the regular classes got smaller; in some comparisons regular classes outperformed regular/aide classes (see Table H-3). The differences between aide and regular were slightly greater in reading than in math. This is what would be expected since almost twice as much time in grades 1 and 2 was spent in reading instruction as in math instruction.

TABLE H-2

Mean Scale Scores and Percentiles Stanford Achievement Test for Small, Regular/Aide, and Regular Classes for Reading and Math, by Grade

	Scale Scores			Percentiles		
Reading	Small	Regular	Regular /Aide	Small	Regular	Regular /Aide
Kindergarten	440.5*	434.2	435.8	59	52	53
Grade 1	530.8*	513.1	521.2*	64	54	59
Grade 2	590.7*	578.9	583.1	62	52	56
Grade 3	620.7*	611.9	614.0	61	54	56
Math						
Kindergarten	491.1*	482.9	483.9	67	61	62
Grade 1	539.0*	525.2	529.9*	59	47	51
Grade 2	586.5*	576.4	578.5	77	68	70
Grade 3	622.8*	615.0	616.2	75	69	69

Year-to-year comparisons of scaled scores can be made, but reading and math scaled scores cannot be compared directly. These means are based on the total number of students at each grade level who have test scores. For reading the n's are K=5126, One=5541, Two=5494, Three=5242. The number with math scores is 50 to 100 higher each year. Out-of-range classes (regular and aide class with n<21, small classes with n>17) have been excluded. The number of aide classes in the analysis K=83, One=91, Two=98, Three=99. (*P < .01)

Table H-3 also shows average gains for low and high SES students in regular/aide and regular classes. Since aides reported spending about a fourth of their "instructional" time working with special needs students, this might be expected to give low SES students an advantage in gain scores over low SES students in regular classes. In the first grade low SES students did gain more in regular/aide classes than low SES students in regular classes, but there was an insignificant gain for low SES students in regular/aide classes as compared with regular classes in second grade. In third grade the low SES regular classes had larger gain scores than the regular/aide classes. In second and third grades, the high SES students in regular classes had bigger gains than the high SES students in the aide classes. The case that an aide helps low SES students more than high SES students is a very weak one.

TABLE H-3

Mean Grade-to-Grade Gain Scores
Stanford Achievement Test Reading and Math Scaled Scores
Regular and Aide Classes
Grades 1, 2 and 3

	Total Group			High SES		Low SES	
Test and Grade	Small	Regular	Regular /Aide	Regular	Regular /Aide	Regular	Regular /Aide
Reading							
Grade One	91.6*	79.4	89.0*	93.3	101.3*	62.7	74.4*
Grade Two	57.0	58.4	59.4	57.9	56.6	58.1	62.3
Grade Three	26.6	28.2	27.1	25.7	24.5	31.7	30.3
Math							
Grade One	45.3*	39.4	44.4*	47.4	47.2	29.8	40.9*
Grade Two	45.1	44.0	46.9	46.2	47.1	40.3	45.6
Grade Three	32.9	34.3	35.2	34.	35.	34.	34.7

*p < .01 Aide Compared with Regular

Gain scores are the student's scaled score in spring of the year minus the scaled score in the spring of the previous year. Students who had scaled scores in both years and in-range classes were included. Total n's in reading were Grade 1 = 3577, Grade 2 = 4171, Grade 3 = 4094; n's in math were about 60-100 higher. Number of Regular/Aide Classes in the analysis were Grade 1 = 91, Grade 2 = 98, Grade 3 = 99

One theoretical reason for a class with an aide to outperform a class without one is that the aide can perform a number of routine tasks for the teacher, freeing the teacher to spend more time in direct instruction of the students. The aide effect is indirect, freeing the teacher to teach more.

In the year-end interviews teachers were asked if there was any difference in the amount of instructional time they spent: 60 percent of the teachers in regular classes reported they spent the same amount of time and 20 percent said they had more time; for the regular/aide aide classes 25 percent said they spent the same amount of time, and 71 percent said they spent more (third grade teacher responses). If the teacher perceptions were correct, and if the time on task research was valid, there should have been a substantial increase in student achievement in classes with an aide. Since an increase in student achievement was only found in first grade, teachers' beliefs that they had more time for instruction was not reflected in student achievement results.

Logs completed by the teachers, as well as the direct observations of a sample of about 20 percent of the teachers in grades 2 and 3, did not indicate that teachers with aides were spending any more time in direct instruction of the students in either reading or math than in the regular classes. The teacher perceptions were not consistent with teacher logs or observation data. Unfortunately, there were no teacher observations in the first grade when regular/aide classes were outperforming the regular classes by the largest margins.

A second possible reason for a class with an aide to outperform a class without one is that the aide could have a direct effect on student learning, by teaching and tutoring students directly. Aides who spent more time in instruction and less in clerical work were hypothesized to have a positive effect on student learning. Since there self-reports of how aides spent their time, the percent of total time spent by aides in instruction can be related to class average achievement gains.

There was practically no correlation between the amount of time aides spent in custodial activities and student achievement in reading ($r = .01$) or math ($r = .01$). This is what would be expected. However, there was almost no correlation between aide time spent in instructional activities and achievement ($r = -.09$ for reading and $r = -.01$ for math). The amount of time spent in clerical activity also did not correlate highly with either reading achievement ($r= .07$) or math achievement ($r = .04$). There was no evidence that the kinds of things aides did, and/or the amount of time they spent doing them had any measurable effect on student achievement in either reading or math.*

Training for Aides and Student Achievement

Since school systems did not provide formal training for aides or for teachers in how to work with aides, it might be expected that special training for teachers and their aides would lead to more effective use of the aide, and subsequently, to improved student achievement. A three-day preschool in-service training program (which is described in another section of the report) was provided to a sample of 13 of the 79 schools in Project STAR for both second and third grade teachers. There were 17 aides and teachers involved in the training in second grade and 16 in the third grade. In the second grade, teachers worked with the aides for a half day on roles and mutual responsibilities and expectations. Some of the training focused on ways that aides could be most helpful to the instructional process, but the training was general in nature. In second grade, the teachers did not know whether they would be assigned to a class with an aide at the time they were trained. In the third grade the teachers had already been assigned to an aide class and their aides had a full day of training which covered roles and responsibilities and gave more attention to the ways that an aide could be helpful in the instructional process.

Training did not make a significant difference in the achievement of aide classes in either the second or the third grades (see Table H-4). Gain score comparisons adjust for any differences in the beginning achievement level of the students in the trained teacher classes as compared with the untrained teacher classes.

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*Additional analyses were done of whether teacher's years of experience, position on the career ladder, or highest degree earned affected the way that they utilized their aides. None of these teacher characteristics were related to the way they assigned aides.

TABLE H-4

Effects of Training for Teachers and Aides on Student Achievement in Reading and Math Second and Third Grades (Scaled Score Gains)

Test and Training Group	Grade 2	Grade 3
Reading		
Trained	64	26
Untrained	58	27
Math		
Trained	46	32
Untrained	48	34

Discussion

The primary conclusion from Project STAR is that aides who are selected locally, untrained, and assigned as general purpose assistants do not make a significant difference in student achievement. The first grade was an exception for which the analysis provided no ready explanation. The results from the other grades all show no difference in achievement in either reading or math between the regular/aide classes and the regular classes. Considering that regular classes had some aide assistance each year except in kindergarten, if a difference had been found in kindergarten and not in grade 1, there would be a ready explanation. The services of a part-time aide (24%-40 percent of the time) were as effective as the services of a full-time aide in boosting student achievement. But in kindergarten, where there were no aides in regular classes, the aides made no significant difference; and in grade 1, where achievement in regular/aide classes was about 10 percent higher than in regular classes, the regular classes had the part-time services of aides.

Lacking a good explanation of why an effect should be found in the first grade, and not in the other grades, there is a tendency to dismiss the finding as a chance happening rather than a real effect. There was also nearly no correlation between the amount of time the aide spent in working with special needs students or in individual tutoring, and class average achievement.

The aide effect (aide class minus regular class) found in grade 1 was not enhanced in grades 2 and 3, but actually decreased, so that by the end of grade 3 the students who were in the aide classes were only slightly ahead of the students in the regular classes. (See Table H-5) This decrease is not due to the entry of new students into the project; it also exists for the cohort of students who were with the project all four years.

TABLE H-5

Effect Size by Grade for Small Classes and Aide Classes in Reading and Math

Test Subject and Comparison Groups	Kindergarten	Grade 1	Grade 2	Grade 3
Small and Regular*				
Total reading	.21	.34	.26	.24
Total math	.17	.33	.23	.21
Regular/Aide - Regular**				
Total Reading	.05	.15	.11	.05
Total Math	.02	.11	.05	.03

* Effect Size = Small-Regular/Standard Deviation of Regular

** Effect Size = Regular Aide - Regular/Standard Deviation of Regular

The aides appeared to have made more difference in reading instruction than in math instruction. Reading instruction in Project STAR made widespread use of reading groups, while math instruction was primarily whole class instruction. It seems reasonable that an aide could have been more useful to the instructional process when work is in small groups than when the teacher is working with the whole class.

Future research on aides' effects on student learning should be directed at ways in which their use might facilitate specific instructional processes and objectives. Based on Project STAR results, the addition of an aide into the classroom gave the teacher help with a lot of routines but doesn't seem to modify the way most teachers taught or the way that they organized instruction. Teachers felt less time pressure when they had an aide and felt that they devoted more time to instruction, but the objective evidence did not confirm that there was much change in time devoted to teaching. If the introduction of an aide was designed to achieve a specific objective (such as more work with "at risk" students) and the aide and the teacher were both trained in how the teacher and the aide could work together to achieve that objective, there might have been a different finding. The addition of a general purpose aide whose role was worked out with the teacher to meet the teacher's needs does not make much difference in student achievement even though teachers felt the aide helped them to devote more time to instruction by freeing them from clerical and custodial duties.

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